

# The Iron Age

A Review of the Hardware and Metal Trades.

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## Coke Ovens.

The subject of coking bituminous coal is attracting much attention at this time among furnace owners and manufacturers who desire a pure fuel at low cost. Formerly coke was made from coal taken without regard to quality, in open pits on the ground or in beehive ovens—a crude and expensive method of producing unsatisfactory results. The manufacture of coke is now carried on in improved and economical ovens, with the aid of expensive machinery for crushing and washing the coal. In the accompanying illustration are shown the coke ovens of the Cambria Iron Company, built by Messrs. McLanahan, Stone & Bayley, at Hollidaysburg, Pa. The following description will be of interest to our reader:

The ovens are each 3 feet wide, 7 feet high and 23 feet long, presenting the appearance of a succession of arcades, closed at each end with iron doors. The arcades, or ovens, are separated by partition walls of fire brick, within which are as many large vertical flues extending from top to bottom, as is consistent with strength. These flues all end in a horizontal flue extending under the whole bottom of the oven. In these flues, which surround the ovens, the gas from the coal is burned, maintaining a high and certain heat, and in the short time occupied in filling and discharging the ovens very little, if any, of the initial heat is lost. The entire operation of discharging and refilling an oven does not take over ten minutes, and the labor of five men. The charging is performed by means of hopper filling cars which run on tracks laid on top of the ovens. Each oven has two filling holes, into which the cars containing coal are emptied. The discharging is effected by means of a powerful steam ram propelled by steam. This, as shown in our illustration, travels back and forth in front of the ovens. On the end of the long rack is a head which just fits the oven. This is pushed through by the aid of powerful gearing, and expels the plug of coke from the door at the opposite end.

When the charge in the oven is ready to be drawn, the filling cars are loaded with fresh coal and brought over the filling holes, the pusher brought up, and the doors at each end of the oven opened. The engine is then started and the ram is driven through the oven, pushing the coke in front of it in a solid mass, and leaving it to cool on the ground on the other side of the oven. The ram is then withdrawn and the doors at each end of the oven closed. The valves of the hopper cars are immediately opened and the oven filled again before it has had time to cool. The charge for an oven is 17,500 pounds of coal, and in 72 hours this charge is coked, producing 13,125 pounds of coke, a yield of 75 per cent. The cost of labor is 35 cents per ton of coke.

The great saving of labor attained by this method of coking is at once apparent. Careful experiments made with coal from the same mine, and during the most favorable weather, showed that 50 per cent. of coke at a cost of 76 cents per ton for labor, were the best results attainable with the most careful management. Windy or unfavorable weather would reduce the percentage of coke and increase the cost of labor per ton. The best results of coking at Hollidaysburg, using the beehive oven was 61 per cent., but a whole year's work showed an average of only 50 per cent., whether beehive ovens or pits were used. This difference is easily accounted for by the utilization of the gases in the oven. These gases are entirely wasted in the coking pits and in the beehive ovens, and the heat required for coking has to be supplied by the combustion of the fixed carbon of the coal. Messrs. McLanahan, Stone & Bayley, of Hollidaysburg, Pa., make a specialty of these ovens and coal washing machinery.

## Wolfram.

The following is an abstract of a paper read before the Polytechnic Club of the American Institute, on the 4th instant, by Dr. L. Feucht-wanger:

Wolfram or Scheelite of iron and manganese occurs as an ore in nature, mostly associated with tin ore, but also with quartz, native bluish, tungstate of lime as scheelite, also in pyrites, galena and blende. Indian has been discovered in Wolfram by the blue spectrum lines. It is found in numerous localities, but principally in Bohemia, Cornwall (England), Saxony and Bolivia; in the United States in Missouri and Connecticut. It crystallizes in the orthorhombic system in brown, shining, prismatic crystals. The twin crystals from Bohemia are very distinct and fine. It has a hardness of 5 and a specific gravity 7. The Connecticut mineral, which is a tungstate of lime, is probably replaced or substituted for iron.

Wolfram has also been found in Canada and Nevada, but formerly it was discovered in considerable quantities in a topaz vein in Trum-

bull, Ct. At Limoges, France, it is also found. This mineral when powdered is decomposed in hot hydrochloric acid, and leaving as a precipitate a yellow residue. It is equally acted upon by aqua regia. With tungstic acid is the precipitate a yellow powder.

Of the alloys of tungsten with other bodies there is but little known, it being too hard and refractory and quite unfriendly to mix either mechanically or chemically with other bodies. It forms, however, a very useful compound and hard alloy when added to steel in a fusing condition. Since 1873 a new era in steel making has been introduced in Austria and France, where the Bessemer process gives great advantages in producing the Wolfram steel. Cast steel had, to that period, been considered the best material for hardness, homogeneity and toughness. The introduction of Wolfram ore, which is composed of 75 per cent. tungstic acid, 20 per cent. iron protoxide and 5 per cent. protoxide of manganese, as a chemical agent combines with melting iron, giving it the nature of steel at the expense of the carbon contained in the iron. The whole opera-

as well with this new compound as with cast steel.

For the production of files, saws, cutting instruments, augers and stamps for coining, all of which require great hardness, the addition of ferro-tungsten may exceed 4 per cent.

Wolfram occurs in very few minerals, and what is more remarkable, it is found in combination with but 4 or 5 other elements in nature. Oxygen, iron, manganese, lime and lead under the name of tungstate of iron; scheelite or tungstate of lime; huebnerite from Nevada, which is a pure tungstate of manganese; magabasite, a compound of tungstic acid with iron, manganese and lime found in Bohemia and Peru; stolzite, a mineral of tungstic acid and lead is found in Bohemia, Chili and Carinthia. In Lower California, at La Paz, a mineral called cupro-scheelite has been found, and is composed of tungstic acid and copper. Wolfram is mostly black, or dark grayish brown, in right rhombic crystals; has a perfect vertical cleavage; fuses on coal to a magnetic globule, and shows iron when fused with borax. With microcosmic salt in the

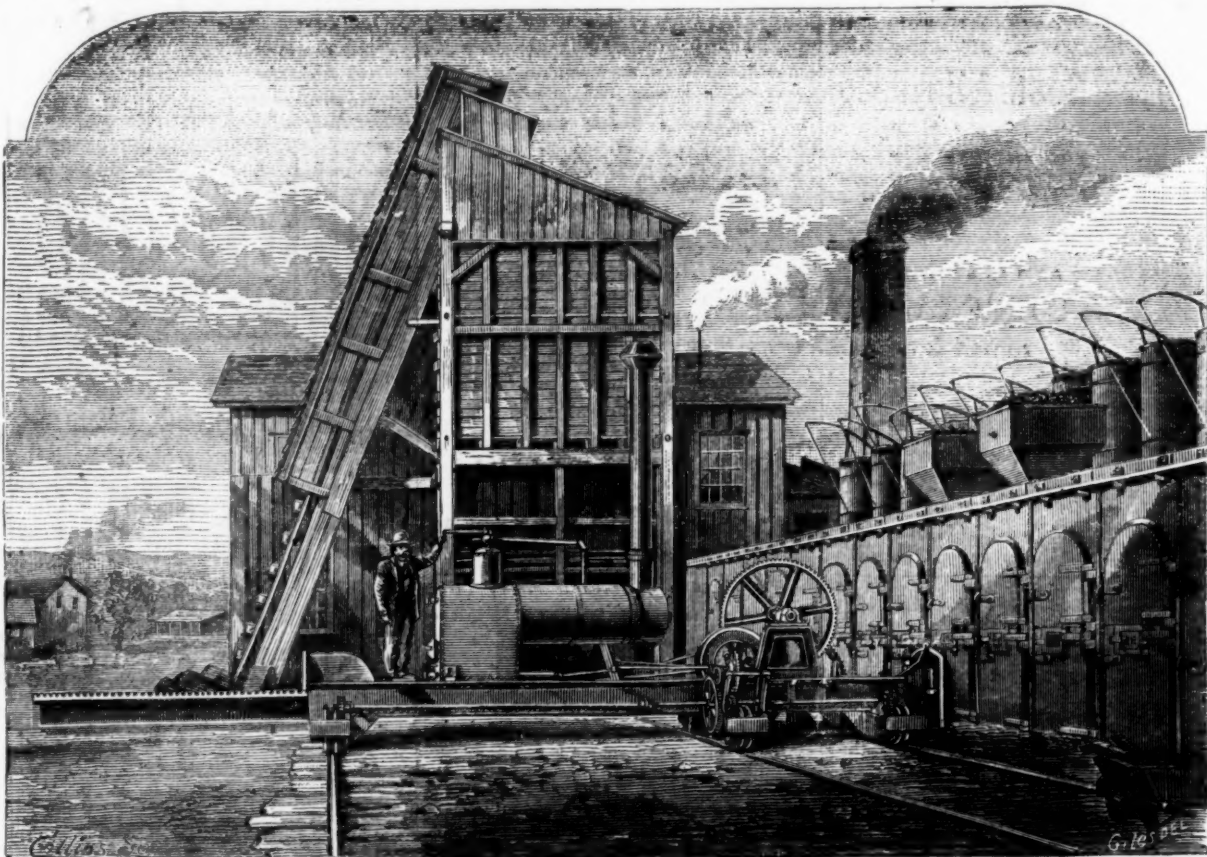
Judges of the exposition held in this city, which has just closed. The judges were Mr. Agnew, of the well known tin and sheet iron working firm of Fleming, Agnew & Co., and Mr. Mitchell, of Mitchell, Stevenson & Co., stove manufacturers. Their report was as follows:

"We have carefully examined this article of planished sheet iron, and we congratulate Messrs. W. D. Wood & Co., the inventors and proprietors of this valuable patent, and have no hesitation in saying that it is of sufficient merit and national importance to entitle it to the highest award for its beauty of finish, as well as for its great utility and durability."

The executive committee indorsed this recommendation, and a gold medal will be given the firm.

## A Chinaman in London in 1687.

A news letter from London, dated July 19, 1687, among some seventeenth century documents, acquired lately by the Manuscript Department of the British Museum, contains the fol-



BELGIAN COKE OVENS OF THE CAMBRIA IRON COMPANY, AT HOLLIDAYSBURG, PA.

tion is performed in the simplest manner without any separate arrangement of the furnaces or careful management, or any special instructions to the laborers. The materials, which may be called the Bessemer Wolfram steel, are brought into fusion in blacklead crucibles, or a reverberatory furnace is made use of and without the need of a huge cupola. The *modus operandi* is also very simple, for as soon as the pig iron is in a melted state, from 1 to 7 per cent. of the Wolfram ore in a fine powdered state is added and an extra quantity of oxide of manganese, say one-twentieth part of Wolfram, and common salt one-tenth of that of Wolfram. All these materials are wrapped up in four or five papers and thrown by degrees into the furnace in single packages, and the puddlers, after having used them all, continue stirring for half an hour until the whole mass appears, to him, uniform. The furnace door is then closed and the fire increased, and the moment he perceives a rising of the mass the process is considered finished. The fire is, however, kept up for another hour before pouring out in flasks or molds. For assisting in the fluxing of the iron and manganese, flourspar and borax may be added.

In France they use  $\frac{3}{4}$  per cent. Wolfram ore for the tires on their roads; the same quantity is used for axes and cutting instruments, stamps, rollers, etc., may consume from 4 to 7 per cent. of the ore. The production of such a kind of steel is known now under the head of ferro-tungsten or Wolfram iron mass, in distinction of spiegel iron or ferro manganese, so largely imported from Germany for the steel manufacturers of the United States, and which is composed of 20 per cent. manganese to 80 per cent. gray iron. The steel made with a mixture of 3 per cent. of the ferro tungsten yields complete homogeneity and toughness, as well as strength; a larger amount would increase the hardness but diminish the toughness. It is a remarkable fact that the bandage steel may be produced equally

inner flame of the blow pipe, becomes dark red, and if tin is added becomes green; with the addition of soda indicates manganese.

## Imitation Russia Iron.

The Pittsburgh *American Manufacturer* of the 18th Inst. says: For years the manufacture of a sheet iron that should equal the well known Russia sheet in its fineness and ability to stand both the weather and the severe tests to which it is put in working, has been the aim of iron masters both in this country and England. In 1871 Percy published in a little pamphlet all the information he could glean on the subject, supplemented by records of tests and of analyses, but the results of following his directions, as well as the outcome of the independent and original experiments of iron masters, have been for the most part of very little value.

In England Percy's book has just been republished, the papers of that country stating that, "just now the interest taken in this subject has shown to be widening, as certain American manufacturers claim to be able to produce an article equal in value to the Russian make, and in sufficient quantities to permit its being offered at a price low enough to rival English sheets."

The firm alluded to is doubtless W. D. Wood & Co., of this city, who have succeeded in producing an iron of a quality that is fully the equal of the Russian, and much below it in price, and as a result is crowding the Russian out of the market. This success is the result of no accident, but is the outcome of over a quarter of a century of effort, Mr. Wood's family having been working toward this end for that time, as the records at the patent office show. The crowning improvement, and that which has made the process such a commercial success is the planishing, which we have described several times, and which was patented some two years since by Mr. W. D. Wood.

A strong indorsement of the quality of this iron has just been made by the award of the

lowing account of a remarkable visitor to England at that time:

"I have been somewhat busy in showing the civilities of the Coast city & Country to a Chinese lately come over who is the first man of learning of that country that ever was known to have come into Europe. His Ma'ty was pleased to be very civil to him himself, & did not only give me his Royal example, but did lay his commands on me to do so & do all the friendly offices I could by letting him see what was most proper to satisfy his curiosity by. He came out of China about 6 years ago in the company of some of the missionary Jesuits, and stay'd 4 of them in Italy, the other 2 in France & Flanders. The occasion of his coming into England was to have the convenience of embarking on one of our East ships & of returning into his own country, with a Genoese Jesuit who goes an apostolic missionair into China to further the conversion of that great people. Our Chinese is a christian by birth his parents having been so before him, is about 32 years of age, of the great town of Nankin, where the Emperours of China had their palace and residence before the first Invasion of the Tartars. By profession he is to be a Jesuit and to enter into orders before he leaves England. The best European language he speaks is latin, tho' he understands french, portuguese & Italian. Of his own language he understands 14,000 characters, w'h is a great deal, if compared to the paucity of our characters & words, but if you consider that they have upwards of 50,000 characters in their alphabet it will not appear so much as is necessary to attain to the exact knowledge of the language in all its extension. I sent him about ten days ago to Oxford, where the ingenious men there had a mind to see him & show him some Chinese MSS. of w'h they have a considerable number in the university Library. Mr. Hyde the Bibliothecarian writ to him to favour them w'th a visit; and tho' he went thither w'th a design of staying only 4 days, yet he is not yet return'd, this being the 11th day."

## A Hydraulic Locomotive.

The San Francisco *Scientific Press* describes a new form of locomotive as follows:

Its origin is traceable to the introduction of flumes for floating lumber from the mountains to the valley. While the flume was and is the cheapest transportation known for the purpose for which it was designed, the transportation of lumber, it served no other purpose. All the supplies demanded at the head of the flume, where the lumber was manufactured, had to be hauled there by teams. These flumes did nothing but transport lumber to the market. They transported nothing into the mountains, and afforded no aid to travel. The flume lay along the mountain sides like a serpent basking lazily in the summer sun. The hydraulic locomotive is designed to make them serviceable in more ways than the one for which they were originally built. It is designed to travel up the flume, and it does it, too, at a lively rate. The steeper the grade, the faster travels the locomotive. This may be in defiance of all former means for the transportation of freight and passengers, but the locomotive will do it, nevertheless. The little wooden structure we saw on trial carried ten or twelve times its weight, and moved up a grade of about one foot to the rod at about half the speed that the current, one inch in depth, ran down the grade. Now what the result will be when it is tried on a scale to be made serviceable for transportation of freight and passengers, of course we are unable to say; but as a toy it is successful, for the little machine, weighing only a pound and a half or two pounds, carried ten or twelve times its own weight. The hydraulic locomotive is constructed with four wheels, and is designed to run on a track like the locomotive engine. The track is to be constructed on the top of the sides of the flume, which may be V shaped or otherwise. The motive power is the water passing through the flume. At either end of the car is a water wheel similar to that of stern wheel steamers. The wheels, like those of an ordinary car in use on our railroads, revolve with the axle. The axle, to which the wheels are attached, is made the shaft for the water wheel, the arms of which, holding the paddles, extend down into the water in the flume. The current of water in the flume furnishes the power to run the car. Of course the car must travel up the flume if it contains sufficient water to turn the paddle wheels. These paddle wheels are so arranged as to be unshipped when it is desired to run down the flume. As all flumes of this character must have a down grade, the hydraulic locomotive is supplied with brakes to regulate the speed on the down trip. We believe the hydraulic locomotive to be practical. Of course it will require a considerable volume of water to move a car of ten tons. This can be obtained near the head of Butte Creek if it should prove desirable to have a flume to the timber of that region, and any volume of water necessary for one down Feather-

River could be had at the lower end of the Big Meadows. Of course the flume would have to be constructed with a view of having the track for the car on the top of its sides, and braced from the outside so that no ties or cross pieces would be required on the top of the flume, as that must be left open for the paddle wheels to work in. If it should cost as much to build a flume of this kind as it does to lay a railroad track, the advantages would still be in favor of the flume, for the economy of motive power is much greater. Indeed, it is nothing at all after the track and flume have been constructed. It would also have the advantage of being narrow gauge, which is an important consideration through a mountainous country. We hope the subject may attract the attention of capitalists and be given a fair trial.

English vs. American Watches.—Sir Edmund Beckett, a scientific horologist, who is, perhaps, the highest English authority upon the subject, in his work upon "Watches, Clocks and Bells," says: "The liability of a watch, like any other piece of mechanism, to require repair is in the ratio of the number of separate parts which make up its unity. The English watch, with its fusee and chain, is composed of 688 more pieces than the American watch. Dispende with these 688 additional chances of breakage, and it is easy to infer the superiority of American watches, in this one respect at least. The fusee and chain are rejected in the Waltham watch, and the direct action of the mainspring adopted, because the fusee and chain add greatly to the cost of a watch and its tendency to injury, and are of no practical value for good time keeping. This change is advocated on the ground that there is greater simplicity of action, less friction in the transmission of motive power, increased facility for using a lighter and more uniform spring, and more room for play in the other parts of the movements." In support of this view, Sir Edmund Beckett speaks very favorably of the American principle of omitting the chain. After alluding to what he calls the "mischievous and common accidents of chain breaking," and noting the tendency of advanced watch making to do without fusee and chain, he says: "Accordingly, both in Switzerland and America, which are gradually stealing away our common watch trade, the fusee and the chain are almost universally omitted."



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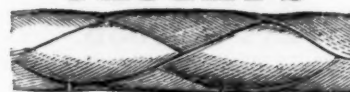
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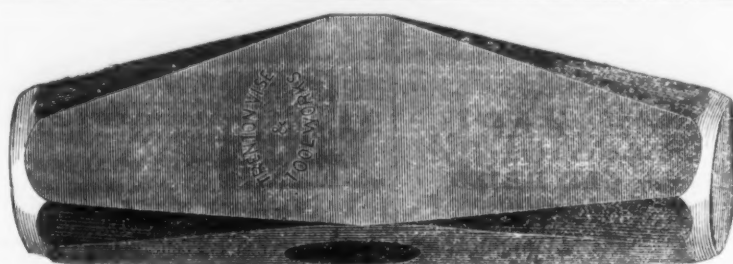


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We herewith illustrate the only really good TEA KETTLE now made. We furnish only the Trimmings for them; and show cuts of the Handle and Spout. The former article is much stronger than any handle which has ever been introduced. It fits the hand splendidly, and being hollow, NEVER HEATS. The car is strong and has a wide base. Altogether it is a fine thing, and sells at sight.

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Re-tinned, per doz.—5 in. (No. 50), 67 cts.; 6 in. (No. 60), 75 cts.; 6 1/2 in. (No. 70), 80 cts.

All are 2 1/2 in. wide.

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Proprietors of the

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December 8th, 1874.

Re-issue, October 28th, 1874.

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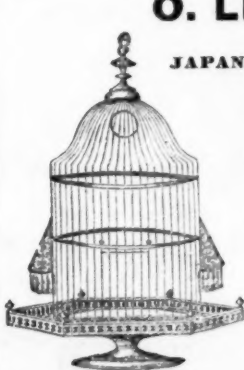
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I sell my Carriage Ornaments to dealers only.

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After the severest tests for the past three years, these skates are now admitted to be the only practical Self-Adjusting Skates in Market. The clamps are first adjusted to the shoe by turning the thumb-screw D when the lever C is in the above position; when once adjusted, place the skate on the foot, close the lever C, and the skate is securely fastened to the foot. By the action of the clamps, the skate is always in the center of the foot, and cannot slide from side to side as in other clamp skates. They require no heel plates, key or wrench.

PRICE LIST. Per Pair.

No. 1.—With Blued Footplate, and Runners the same as the best..... \$5.00

No. 2.—Same as No. 1, only nicely Nickel Plated, effectually prevents the skate from rusting..... \$6.00

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## The Venetian Navy.

In the 16th century Venice kept in permanent employment about sixteen thousand men. The pay of these was exceptionally good, and their privileges were great; their sons, at an early age, were entered in the workshops, and instructed in some one of the many trades carried on in them; they themselves, when old, were pensioned or admitted into a hospital established especially for the navy. On the other hand their work was severe. They were not only workmen, but soldiers, trained to the use of arms and the strictest discipline; their leading men, foremen and overseers being in turn their sergeants, lieutenants and captains. The government, in all working details, was in the hands of practical men, chosen from the workmen themselves, the highest of whom, with the title of grand admiral, exercised superintendence over the whole. But the supreme command was vested in the proveditor general, a noble of high rank and distinguished service, either as commander afloat or as statesman ashore. It was a marked peculiarity of the Venetian constitution that untried men could not hold any important office; their public men had to serve a long and laborious apprenticeship in subordinate positions, before they were considered qualified to take any prominent part in the affairs of the state; and amidst a people so peculiarly nautical few could mount the several steps of a long career without obtaining an insight into the conduct of naval business. At the end of the 15th century the control of this enormous establishment was found to be beyond the power of one man, and two assistants were appointed, one as proveditor of the arsenal, who had more especial charge of the armory; the other as proveditor of artillery, whose title explains itself. Contrary to Venetian usage, which limited the duration of public office to sixteen months, these three were appointed for a term of three years, one going out each year in rotation, so that the majority of the three were at all times thoroughly conversant with the details of the administration. For the office of proveditor was altogether administrative; the proveditor general, or the three in council, were the representative and mouthpiece of the state, and their duties may fairly be compared to those of our lords of the admiralty in their relation to the dockyards, independent of their executive authority over ships or men afloat. The grand admiral, again, corresponded in some degree to the admiral superintendent of our yards, but with a much more extensive command, which included everything relating either to the building, the fitting out or the arming of ships-of-war. His office was thus one of very great importance and of corresponding dignity. In an age of aristocratic exclusiveness his privileges were almost equal to those of the nobility, and on occasions of ceremony he wore a similar costume. This is specially described as consisting of a robe of red satin, over which was a vest that came down to the knees, and a cap of violet damask with a heavy bullion gold fringe. At State inspections of the arsenal he had a post of honor; when distinguished foreigners wished to see over the works he was their official guide; and when, on Ascension Day, the Doge, with all the pomp and splendor of rich Venice, went out to wed the Adriatic, he took command of the Bucintoro, the galley of the state.—*Fraser's Magazine.*

## A New Australian Mail Service.

The San Francisco *Journal of Commerce* says: At length, with the sailing of the Vasco de Gama, a new Australian mail service is inaugurated, which, unlike all the preceding ones, has about it the elements of permanency. The mail company, with their powerful fleet of steamers, will be able to do what has never yet been done, and will entitle themselves to everlasting credit for having established a permanent Australian steam line. That this was a consummation to be devoutly wished all who have taken the trouble to inform themselves on the subject of Australian commerce and its possibilities, will cordially agree. Here we have, within a month's or less easy steam communication, one of the most flourishing groups of European colonies on the globe, destined at no distant day to develop into a mighty southern empire.

A present their principal communication with civilization is by a roundabout way with England—a voyage of nearly 18,000 miles, while the shores of the United States are accessible at much less than half that distance. Already it has an active, bustling population of 2,000,000, whose imports and exports together aggregate not less than two hundred and fifty million dollars annually. At present Great Britain enjoys the benefit of this gigantic trade. Could we but turn it to our shores, just imagine for a moment the impetus it would give to enterprise of all kinds, and particularly on the Pacific Coast. Nearly all this trade consists in the export of raw materials and the import of manufactured articles, and the United States has as many facilities for doing it as has Great Britain. Were it but turned thither the idle mills and furnaces of the Eastern States would be filled with busy, happy, contented workmen, and the city of San Francisco, become its center, would advance with a speed twice that ever experienced. In time California would manufacture as well as export, and when this fast rising group would enter on the industrial path themselves, there is sufficient diversity of climate and products to leave room for the building up and keeping up of a mighty trade. Australia lies principally in the tropical—California, Oregon and Washington principally in the temperate zone, and the interchange of native and cultivated products would be both useful and profitable.

We have already dwelt at considerable length on the particulars of what this trade might be, and do not propose to recur to them here.

Three months ago we were the first to announce the negotiations for this line, and are now pleased to be able to state that it is an accomplished fact, and that already the signs of a large and profitable trade are both numerous and encouraging.

If our merchants only show a proper enterprise there is no doubt of the future of this trade; if they do not, it will continue to languish on from year to year in the same unsatisfactory way that it has lingered for a few years past. Much has been done by individual effort, but individual effort is not equal to the task; our principal merchants should come together, talk the matter over, and send agents down to report on the situation, and establish agencies for buying and selling in Sydney, Melbourne, Auckland, Brisbane, Adelaide, Hobart Town, and other important centers of trade. The chance is now presented to them; will they avail themselves of it? will they fix matters so as to be able to avail themselves of it? will they put in sufficient capital and show sufficient enterprise in the matter? If they do, the trade of a people of two millions, rapidly increasing in numbers and wealth, is in their hands.

**New York and the Centennial.**—The visit of New York merchants and bankers to Philadelphia, on the invitation of the Centennial Commissioners, is, in every respect, a proper method of enlisting this city in the Centennial enterprise. It is calculated to effect a direct appeal to each of the leading business interests of the commercial emporium of the country. This is the true method of engaging support. There is directness in it; it is calculated to canvass the whole ground; and it will bring into play the motives to which such an undertaking most directly appeals. We presume that the gentlemen from this city who by resolution obligated themselves to "present the objects and purpose of the Centennial before the interests they respectively represented," will do so in good faith. They supported a resolution pledging themselves "to appoint separate committees to present the subject in proper form to their respective constituencies," and in so doing they have assumed the responsibility for the canvassing of the leading branches of business; and, therefore, whatever success or failure may attend the effort to get subscriptions in this city, the credit or discredit will fall upon these respective interests and on New York alone. This is as it should be. Our help should be spontaneous rather than the result of applications from Philadelphia. That city has already shouldered much more than its share of the burden, and our own citizens should feel that they are now called upon to do their part generously and without being "dunned." The true spirit in which this appeal should be met is not that of a desire to get over it as easily as possible, but of generous rivalry among the various interests, and of ambition not to be outdone by our generous sister city. We do not believe that, when the claims of the undertaking have been fairly presented to our exchanges and our men of capital, it will be found there is any disposition to let the burden rest upon those who have so spiritedly assumed its great responsibilities. If the result should be otherwise, we should be ashamed of the mean-spiritedness of our merchants and should have to change our estimate of their respect for pluck and enterprise, wherever found.—*N. Y. Bulletin.*

The enlarged and reorganized fleet of the Pacific Mail Company now embraces twenty-seven vessels, with an aggregate measurement of 75,510 tons, as follows: City of Peking, 579 tons; City of Tokio, 5079 tons; City of San Francisco (new), about 3500 tons; City of New York (new), about 3500 tons; City of Sydney (new), about 3500 tons; Colima, 2905 tons; Acapulco, 2572 tons; Granada, 2685 tons; Colon, 2714 tons; City of Panama, 1490 tons; Great Republic, 3881 tons; China, 3836 tons; Colorado, 3727 tons; Alaska, 4510 tons; Constitution, 3575 tons; Arizona, 2793 tons; Montana, 2676 tons; Henry Chauncey, 2656 tons; Nevada, 2145 tons; Costa Rica (side-wheel), 1917 tons; Costa Rica (propeller), 1457 tons; Dakota, 2135 tons; Oregonian, 1914 tons; Golden Age, 1869 tons; Honduras, 2100 tons; Salvador, 1065 tons; Winchester, 730 tons. In addition to these, the company have several fine British iron steamers under charter, including the Vasco de Gama, which will sail shortly as the pioneer ship of the new Australian line. The board of survey at San Francisco has reported that the Tokio is in sound and good condition, but deems it advisable that some repairs be put on her, and as a matter of precaution, that she have an iron main deck, fore and aft, together with box-stringers, &c., and various other strengthenings. This will cost about \$150,000.

Messrs. Stephenson & Co., car builders, of this city, are now sending street cars to Russia, to be used on the tramways of St. Petersburg. They are of a peculiar structure, being arranged for 22 seats inside, and the same number on the top. The length of the cars is 26 feet. As no passengers will be allowed to stand, the cars, when loaded, can be drawn by two horses. The roofs are curved, and the seats on the top are reached by stairways at each end of the car. The empty cars weigh about 4650 pounds, and cost, at schedule prices, \$1155 each. Mr. Stephenson stated that the cars of European manufacture cannot compare with those manufactured here in elegance, lightness, or durability. His company had furnished cars for the Birkenhead Tramway in 1869, and from that time English manufacturers had been working on American models. There is at present in this country, as inspector of cars intended for the St. Petersburg Company, a Russian government official. The St. Petersburg Tramway Company, however, is a private corporation, and Mr. Stephenson is of opinion that the Russian government aids such enterprises for the development of the cities.



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Wrought Iron Beams. Iron of all sizes and shapes  
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**ULSTER IRON**  
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**Manufacturing Iron**  
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Pascenic Rolling Mills.  
Books containing Cuts of all iron now made, and Sam-  
ple Pieces at office. Please address 55 Hudson Street.

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**Hickcox Mfg. Co.,**  
280 Pearl Street, N. Y.,  
Manufacture the Patent Corrugated Iron Shingles,  
making the most durable Roof in the market, not  
affected by contraction or expansion, which causes  
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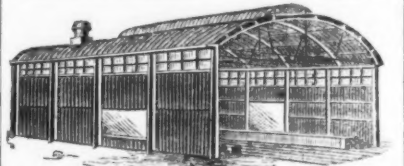
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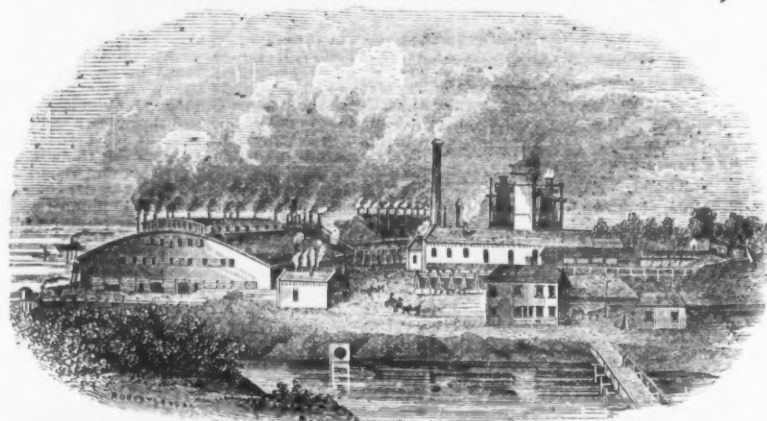
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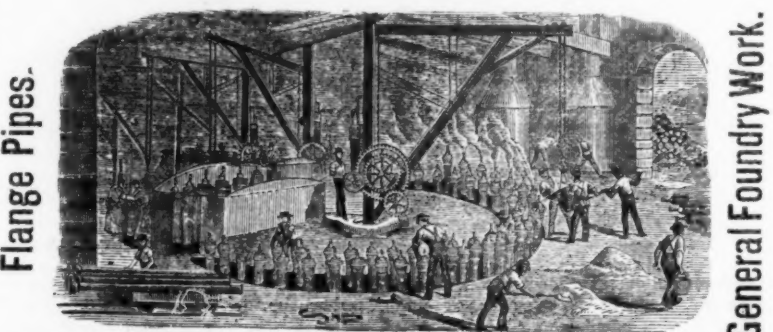
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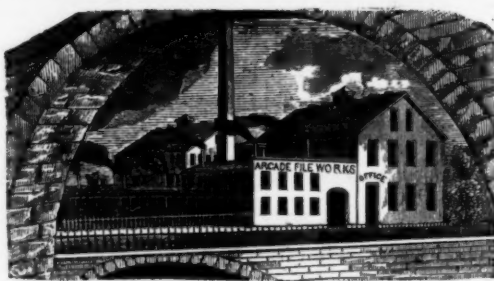
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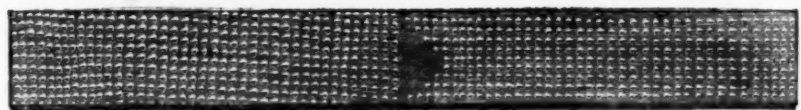
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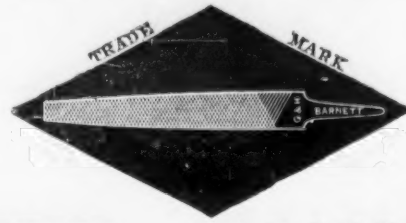
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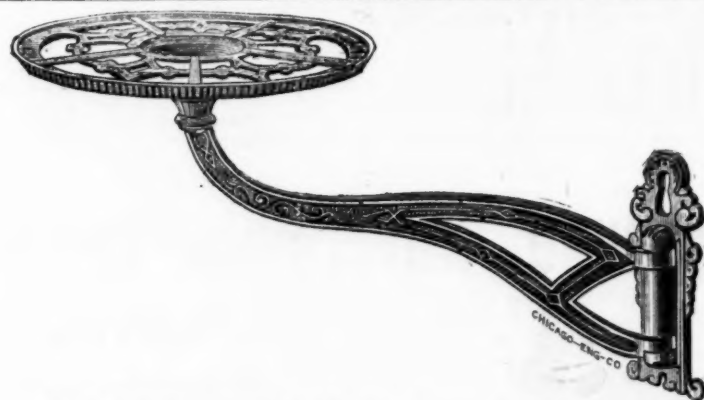
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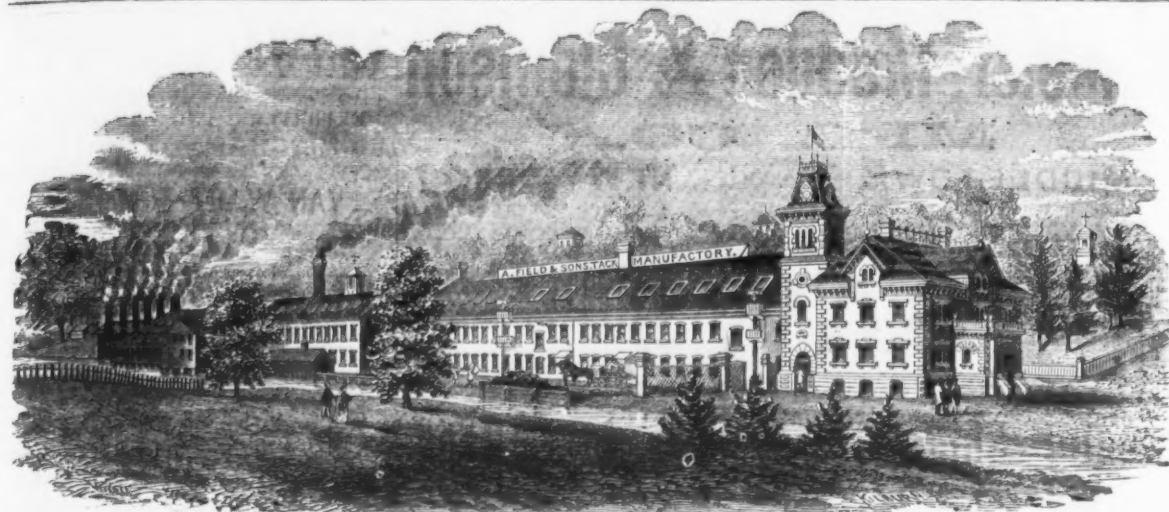
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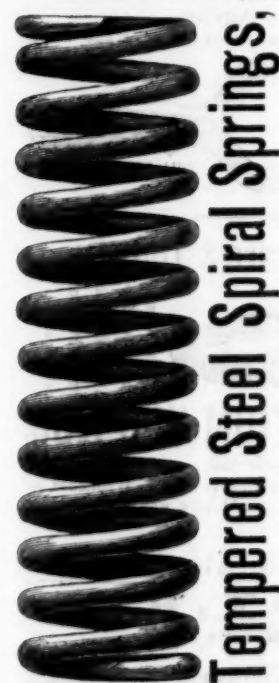
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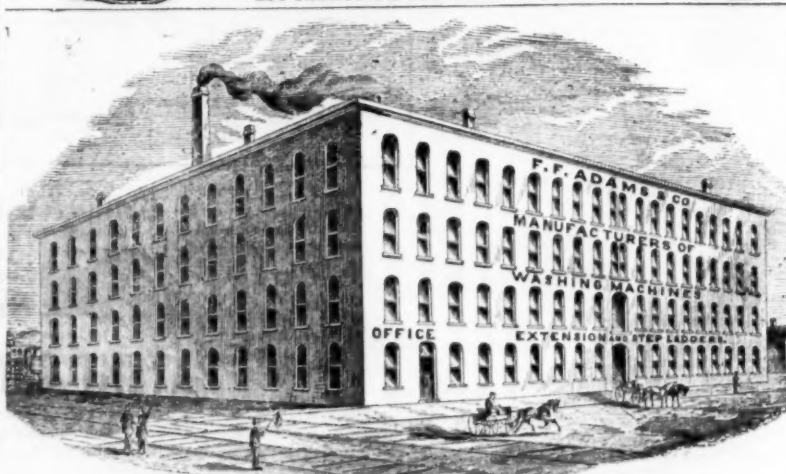
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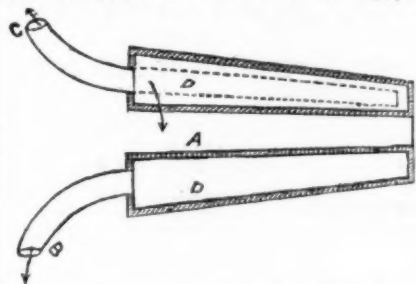
Step Ladders, Extension Ladders, Clothes Horses, Towel Rollers,

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### Blast Furnace Tuyeres.

We have no available data to enable us to state how many men are killed or grievously injured every year by explosions resulting from the bursting of blast furnace tuyeres. It is certain, however, that the number of such casualties is very considerable. Only a short time has elapsed since an accident of this kind occurred in Wolverhampton, by which four persons were killed or seriously injured. Only recently a tuyere gave way at the furnaces of Messrs. Jones, of Birchills, Walsall, injuring some 15 individuals, three of whom have since expired. It is time that such events ceased. If it could be proved that they were inseparable from the operation of a blast furnace then they would be lamentable; as it is, they are disgraceful. It can easily be demonstrated that they in all cases result from the use of tuyeres of defective construction; and it is equally true that tuyeres may be used which, with common attention, will never fail. The principles involved are really very simple—so simple, that it is remarkable that they are not better understood. A tuyere is nothing more than a metallic nozzle through which air is injected into a blast furnace. This nozzle is fixed in the walls of the lower portion of the furnace in a way which we need not stop to describe. The inner end of the nozzle is exposed to an extremely high temperature, and no opportunity is afforded for the cooling of the iron of which the tuyere is composed by radiation or conduction. When cold blast was used the entering air carried off much of the heat, and tended to keep the nozzle cool, but the hot blast now used would, of itself, suffice to raise the metal nearly to a red heat. Iron glows in the dark at about 800° Fah., but the temperature of the hot blast constantly rises far above this point, a blast as hot as 1200° not being very uncommon, while a temperature of 1400° has been reached occasionally in the Middlesborough district. Under such conditions a tuyere would not last a week if some special arrangement for keeping it cool were not adopted. But one expedient is available. A constant circulation of water ought to be maintained over every portion of the tuyere, except the inside of the blast nozzle, and the portion passing through the wall—we say, "ought to be maintained," but in point of fact it is not maintained, and in this circumstance we find the cause of the accidents to which we have referred. The ordinary Staffordshire tuyere consists of an annular casing,



similar in its general features to that shown in the accompanying sketch. The blast enters at A, while D D is an annular space, into which water flows through one of the pipes C or B, escaping through B or C. The water is derived from some elevated source, such as the tank supplying the hoists, and is generally under considerable pressure, although there are exceptions to this rule. Now, the portion of the tuyere which gives way is almost invariably the inner end at E E. The whole affair is usually welded up in plate iron, although cast iron has been used, and the welds at the inner end are often very defective, as it is rather a troublesome operation to make a thoroughly good weld of the kind. Of course a bad weld increases the risk of accident. So long as the water really circulated through the space D D, however, it is not likely the metal would be burned through. But the whole arrangement is practically defective in that no proper measures are employed to secure circulation. In all cases a stream of water will take the line of least resistance, and there is no inducement whatever for the water to flow to the inner end of the tuyere at all. On the contrary, it will follow the course indicated by the small arrows in our sketch, passing round the internal air pipe in close proximity to the back end of the tuyere. In a very short time the water at the inner end is highly heated, steam is formed, and the water is for a moment blown away from the front end. The steam is condensed at once by the cold water, which then rushes forward and fills the annular space again; and so the process is repeated, the iron being overheated every time. The phenomena to which we refer are not easily detected from various causes in the case of a blast furnace; but we have met with them in a very striking way in the tuyeres of large smiths' fires, which we have known to broil dry by ejecting their contents every few minutes when the water pipes were not properly fitted. The heat to which a blast furnace tuyere is exposed is so extremely intense that it is not easy at any time to keep water fully in contact with the metal; and the result is that the latter must be overheated and destroyed, in the same way that the plates over the bridge of a boiler flue are rapidly destroyed under some conditions. The contact of slag or molten iron with the tuyere hastens the work of destruction.

The remedy is not far to seek, although it would appear that the subject is invested with astonishing difficulty by some persons. We find all sorts of materials tried, as though the fault lay in the metal. Phosphor bronze, gun metal, brass, copper, all have been used, but the truth is that if only proper precautions are used to secure an adequate circulation of cold water through the tuyere it will not be overheated, and will last for months if not for years. One of the most obvious ways of securing the required end is to take the water in

through a pipe arranged as shown by the dotted line in the sketch. Cold water must under such conditions of inflow reach the innermost extremity of the tuyere at that point most exposed to accident. Another and probably a better plan, consists in suppressing the annular space altogether and using instead a coil of pipe, the rings or whorls of which are quite close together. We believe we are correct in saying that where such tuyeres are used accidents are unknown from their failure. In the Cleveland district only coiled tube tuyeres are used, and we never hear of tuyere explosions in that district. We use the word explosion in a somewhat conventional sense, but it may be well to explain that the disastrous results which ensue on the bursting of a tuyere are caused by the entrance of water into the furnace and its conversion into steam there—not from the bursting of the tuyere *per se*. Indeed, there is seldom sufficient pressure in a tuyere to cause a violent rupture of its parts: the iron burns through, a hole is made, the water escapes and is converted into steam with explosive violence, the tuyere playing no part in the destructive effects which follow on its failure. Mr. Lloyd has used for some time past, at the works of the Darlaston Steel and Iron Company, a tuyere which is kept cool by spray, small jets being thrown on the metal, and the arrangement, we understand, works very well.

One point in connection with tuyeres deserves notice. Care should be used in the selection of the water used; instances are not unknown in which a tuyere and its connections became choked up with a deposit of lime. The same laws operate here as those which hold good with the generation of steam in a boiler; the purer and softer the water that is used, the better; and where really excellent water cannot be had, great care should be taken to ascertain from time to time whether deposit is forming in the tuyere to a dangerous extent. No conceivable arrangement, be it remembered, will guard effectually against the consequences of using bad water.—Engineer.

### The Iron Industries of Russia.

On the 18th inst. Mr. George Bakmeteff, Secretary of the Russian Legation to the United States, arrived in this city from Washington. Representing the Russian Minister, he waited upon Director General Goshorn, of the Centennial Exhibition, with a formal request for space in the Exhibition buildings. The amount asked for was 20,000 square feet. The Director General was obliged to inform him that the original allotment to Russia was only 11,000 square feet in the main building, and that it was now too late to admit of more room being given. He assured the secretary, however, that if it were at all possible to secure the required additional amount in the other structures it should be done. The Director General is to make investigation, and will do the best possible under the circumstances. The interview was of the pleasantest character, the Russian representative expressing himself as highly pleased with the Exhibition, and declaring the opinion that the display from his country would be large and interesting, especially if the additional space be obtained. He returned to Washington without visiting the Exhibition grounds, on account of the unpleasant weather, but will return to this city shortly—probably with His Excellency the Minister from Russia.

In view of this determination on the part of Russia to participate in the Centennial, our readers may be interested in the following, not very flattering, account of the state of the iron manufacture and trade, published in a stock journal of St. Petersburg not long since.

In 1863 the total value of the metals imported into Russia, inclusive of machinery, was only seven and a half million roubles, while now it has risen to 90,000,000 roubles. In order to build 20,000 Werst of railway, Russia was obliged to draw on other countries for over 100,000,000 pounds of rails, and more than 3000 locomotives. These rails and these locomotives are wearing out year by year, and must be replaced by new. While in other countries old rails are worked over again, with us there are whole mountains of old rails, they say over 25,000,000 pounds, lying along the line of the railroads, and we don't know how to make use of them. This valuable metal, which is everywhere else made useful at once, here lies for years unprofitable as dead capital, and new rails to supply their place must be continually imported from the West. Not a single establishment for the production of railway material can secure a firm foothold in Russia, and all such works drag along from day to day, increasing their debts and making greater and greater sacrifices in order to continue their business. The government has expended enormous sums at various times and for various purposes in order to assist the iron industry, but all these offerings have been of no essential use or had any perceptible result. The retrogression in all branches of our iron industry is daily becoming alarmingly greater. The quantity of pig iron which a country produces may generally be taken as a measure of its own iron industry. The production of Russia as compared with other countries stands in the following ratio: In 1873 England produced 417,000,000 pounds of pig iron; the United States, 167,000,000; Germany, 130,000,000; France, 85,000,000; and Russia only 28,000,000, while in 1783 we exported 3,000,000 pounds to England, and only 1,000,000 was produced there. We cannot, of course, measure ourselves by England or America, but in comparison with Germany, where a few years since a like sad state of the iron industry existed, we must, in proportion to our population, increase our annual production of pig iron from 25,000,000 to 220,000,000 pounds. To attain this result we must increase our 180 blast furnaces by about 1000. If we reckon one pound cast iron at only 40 kopeks, the value of our annual domestic production would be increased in this way about 100,000,000 roubles.



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39 West 4th St., New York.



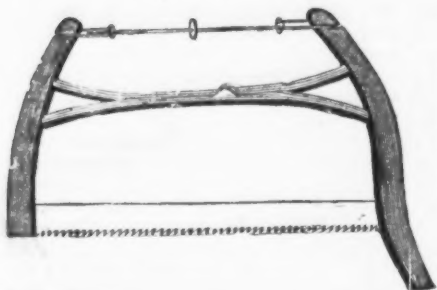
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**Saws of all kinds.**

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**Elliptic Forked Saw Frame.**

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The annexed engraving represents my ELLIPTIC FORKED SAW FRAME, which commends itself to the trade for its simplicity of construction. The Forked Frame being all in one piece, without any center bolt, secures for the Frame great strength and durability. These Frames are put up with my best Webs, marked "No. 40, Harvey W. Peace."

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**PERFORATED CROSS-CUT SAWS**  
And SOLID SAWS of all kinds. Trenton, N. J.

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DIAMOND CROSS-CUT SAW.**

\$1.50 Per Foot.

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THIS new Saw, which is destined to take the place of all Cross-cut Saws in point of **SPEED AND EASE**, is manufactured by **E. C. ATKINS & CO., Indianapolis, Ind.**, who are the **SOLE MANUFACTURERS FOR THE UNITED STATES.** So confident are we that this is the best Cross-cut Saw in the market that we **CHALLENGE THE WORLD.** Orders promptly filled.  
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Thrall's Try Squares, Bevels and Rules,  
J. P. Verre's Hammers and Edge Tools,  
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Stillman's Saw Sets,  
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C. S. Griswold, Augers and Bits,  
Romer & Co.'s Pad Locks,  
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Also Sole Manufacturer of

**LIGHTNING SAWS.**

Two Direct Cutting Edges, instead of one Scraping point.



Note extra steel and durability over the old V, outlined on M tooth.

Telegram Dated Oct. 1st, 1874.

STATE FAIR, EASTON, PA.

To HENRY DISTON &amp; SONS:

Philadelphia, Pa.

I want you to publicly test that challenge on Cross Cut Saws. Name time and place within thirty days. American Institute preferred. **E. M. BOYNTON.** Henry Diston & Sons, dare not respond.

**E. M. Boynton** gave on Wednesday of last week an exhibition of what his Lightning Saw could do at the Pennsylvania State Fair, in which two men sawed through a sound oak log, 16 inches in diameter, in 17 seconds. Mr. Boynton informs us that his export trade is increasing, he having lately made large shipments of his saws to Australia and other distant markets.—*The Iron Age*, Oct. 8, 1874.

For fuller report of this exhibition see the *Easton Morning Dispatch* of Oct. 1st, 1874.  
Henry Diston & Sons cannot furnish Lightning Saws. Why do they imitate mine?

**J. FLINT,**

Manufacturer of

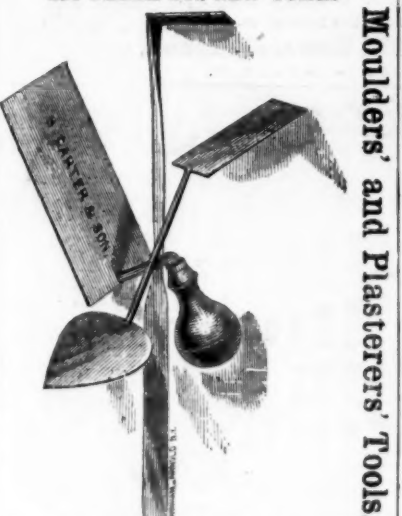
**ALL KINDS OF  
SAWS**

And Plastering Trowels,  
**ROCHESTER, N. Y.**

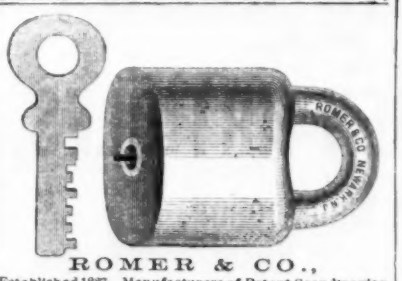
A large Stock of Cross Cut Saws constantly on hand. Orders filled promptly. Dietrich's Double Hand saw One Man Cross Cut Saw made with any kind of tooth desired. Our patent method of grinding Hand Saws makes them superior to any in the market. Send for Illustrated Price List.

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Manufacturers of and Dealers in all descriptions of Moulders and Plasterers' Tools, and Dealers in General Hardware, Gilded Copper Weather Vanes.  
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" " " 3 to 4 in. . . . . 12.00  
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make a specialty of the LARGEST SIZES of Circular Saws, and call particular attention of lumber manufacturers to the following points of excellence:  
**Evenness of Temper.**—The peculiar structure of my furnace subjects all parts of the saw to a DEAD heat, and when dipped in the oil bath secures perfect uniformity.  
**Perfect Accuracy in Thickness.**—My saws are ground on a patent machine, automatic in its operation, grinding off the thick places upon the plate before the thinner parts are reached, and when the saw is removed, **BALANCES PERFECTLY**, which is proof positive of the right accomplishment of the work.  
**Properly Hammered.**—Great care is taken that no saw shall leave my works without due attention in this important particular. A saw too tightly strained upon the run, or too loose in the center, cannot be successfully run—hence the importance of so hammering the saw as to effect equal strain in all its parts, and at the same time RUN TRUE. This department is under the personal supervision of myself, who has devoted over twenty years to the art of saw making.  
I am sole proprietor and manufacturer of the celebrated "**Ohlen's**" Cross-Cut Saw. Price Lists of all kinds of saws sent on application.  
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Comprising  
Store Door Locks, Night Latches,  
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All of which are furnished with

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Which are stronger than steel, and cannot be affected by rust, and will remain bright and clear under all ordinary circumstances.

A candid examination will convince the most unbelieving, that for simplicity, durability, convenience, and safety, they challenge comparison with any now before the public. Being made entirely by new and expensive machinery, especially constructed to manufacture them, they will rival the best made Locks in Finish and perfect operation.

These Locks give perfect satisfaction, because they are the safest, cheapest and most durable Lock ever presented to the public, having thirty-five finely finished Brass Tumblers in each Door, and twenty-eight in each Drawer Lock, each one being finely false notched.

Each tumbler bearing on the key at two different points while locking or unlocking, without the aid of springs, which cannot be said of any other patent Tumbler Locks in use.

**THE LOCKS ARE FITTED TO THE KEYS**

And not the Keys to the Locks.

**Hence Counterfeit Keys cannot be made.**

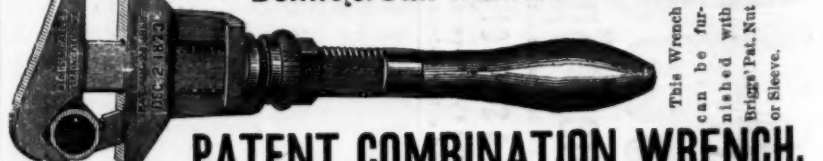
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OFFICE and WORKS, Cazenovia, N. Y.,

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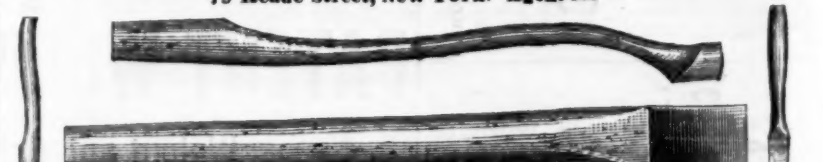
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These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, Case-Hardened throughout, and not only combine all of the superior qualities of our cylinder or Gas Pipe Wrenches, but also all requisite combinations of a regular Nut Wrench, thus making a Combination which has no equal. For Circulars and Price List, address,

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TABLE KNIVES AND FORKS OF ALL KINDS,  
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Also the exclusive makers of the "Patent Ivory" or Celluloid Knife, which is the most durable  
White Handle Knife known. These handles never get loose. Always call for the "Trade Mark"  
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**THE MILLER BROTHERS CUTLERY CO.,**

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**PATENT FINE PEN & POCKET CUTLERY**

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The only knives made that are put together in such a manner that there is no strain on the covering or frail part of the knife. We warrant our knives equal in cutting qualities and workmanship to any made, and are acknowledged by English makers as the Best American Knife. We also make

**NICKEL & SILVER PLATED POCKET KNIVES**

which will not rust or become discolored when used as a Fruit Knife, and their cutting qualities are equal to any other knife. Orders filled from the factory, and in New York by Messrs. J. Clark Wilson & Co., No. 81 Beekman Street (who have a full stock of all patterns always on hand), and also by Messrs. G. B. Walbridge & Co., No. 99 Chambers Street.

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Made by a new process RECENTLY PATENTED which enables me to produce goods that in quality, finish and general excellence surpass any. All warranted Solid Cast Steel Blades.

ESTABLISHED 1853.

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**PEN AND POCKET KNIVES,**

MANUFACTURED BY **PEPPERELL,**

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**ENGLISH and ATLANTIC SCREWS,**

Iron and Brass, Flat and Round Heads, and

though the American monopolists may eventually stop

the importation, his friends may rely on any orders

being executed at the most favorable

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**FREDERICK WARD & CO., Sheffield,**

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301 Broadway, NEW YORK.

**FURNESS, BANNISTER & CO.**

Manufacturers of

**Fine Table CUTLERY.**

Cor. Nassau & Sheffield Sts.,

NEWARK, N. J.

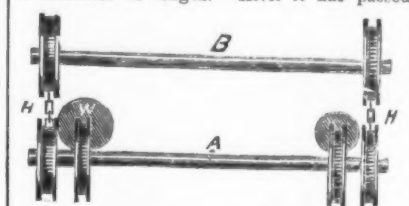
The Construction and Management of  
Roll Trains for the Manufacture of  
Heavy Bars, Rails and Girders.

BY WILLIAM HEWITT, M. E.

PART IV.—Appliances for Economizing Labor at  
the Rolls.

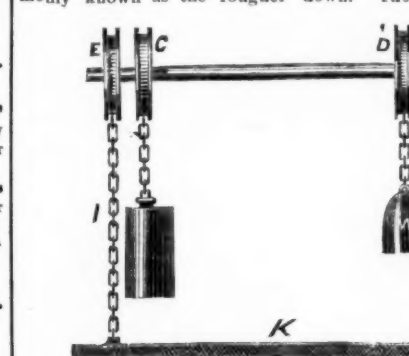
(Continued).

The labor employed for handling the iron at the rolls in rail and beam mills varies with the style of mill and amount of machinery employed for this purpose. The labor on the ordinary "two high" rail mill includes one rougher, two catchers, a finisher, five hookers-up, a buggyman, and three men for dragging off and sawing. The buggyman carries the pile from the furnace to the roughing rolls, and enters it in the first groove. As soon as it has left this groove it is raised by the hookers-up above the top roll, placed in the succeeding groove and pushed over by the catcher belonging to this set of rolls, aided by the hookers up. As it comes over it is allowed to fall upon the buggy, when the rougher, aided by the buggyman and hookers-up, forces it into the next groove. This operation is repeated for each succeeding pass, the rougher and catcher always taking hold of the end of the bar first presented to them, and walking back and forth with it as it increases in length. After it has passed



through all the grooves in the roughing rolls, it is transferred to the finishing set, where the buggyman is no longer needed, as the weight of the rail is more distributed in area on account of its increased length, and consequently more easily managed by the hookers-up. Otherwise it undergoes the same manipulation as at the roughing roll, but the finisher and his catcher have farther to walk, and a few more hookers-up are employed. When the rail has left the last groove it is dragged off to the saws by men, or by means of a chain which winds on a drum driven by any convenient mechanism, usually by the latter mode. It is next sawed to length, curved slightly concave at the flange over a number of short bars arranged for that purpose, and finally shoved off on a bed with the other rails and allowed to cool.

The distribution of labor on the "three high" mill is usually the same as that above described, but the catchers in this case become roughers, and are called the roughers-up, in order to distinguish them from the rougher in front of the train, who is commonly known as the rougher down. The



finisher superintends the train, and must be a man possessing considerable skill and experience, as he has to adjust the rolls for every size and pattern of bar, and be responsible for the accuracy of dimensions, and to a great extent, the quality of the finished product. The distribution of labor on the beam mill does not differ in any respect from the preceding. On the reversing mill, however, the hookers-up are evidently unnecessary, but may sometimes be convenient. The other labor is the same as on the "three high" mill. In rolling armor plates the metal is received upon a buggy at each side of the train. There are no hookers-up, but the roughers and catchers are increased in proportion to the weight of the slab. A finisher, of course, is always requisite.

The increasing demand for large rails and beams and heavy armor plates has caused the ordinary complement of men at the rolls to become inadequate and expensive, and rolling mill men have been compelled to call in the aid of machinery, to a more or less extent, for moving at the rolls these heavy masses of iron.

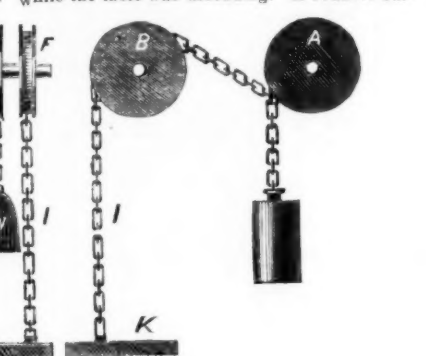
Automatic buggies have been used with considerable success, but they only take the place of one man, and release but a small portion of the labor. The greater part of the labor is expended in lifting the iron and moving it from groove to groove, and it is therefore vastly more important that this portion should be dispensed with, if possible.

A machine was constructed by Mr. Borsig, of Berlin, for dispensing with this portion of the labor, some eight or nine years ago, and applied to a "two-high" mill in his works at Moabit. It is still in operation at those works, and "consists of a single acting steam cylinder, mounted in a frame at the top of the housings; and the piston rod, which passes up vertically through an adjustable bearing, is connected to a cross piece which can be moved up and down in two vertical slides. Outside of the guides, the cross bar has attached to it a series of connecting links, to which the two inclined feed plates or tables, one at each side of the rolls, are coupled by means of wrought iron rods, so as to be firmly connected with the cross bar, and to follow its movements in a vertical line. The cross bar being connected to the piston

rod, is lifted by the pressure of steam in the cylinder, when admitted below the piston. The effect of this movement is, that the guide plates at both sides of the mill are raised simultaneously to the height required for passing the article back over the top roll, and the revolution of the top roll itself takes the article back to the front of the rolls by friction." (*Engineering*, March 15, 1867). This machine requires but a boy to work it, and dispenses entirely with the buggyman and hookers-up; the other labor remains the same.

Mr. George Fritz, of Johnstown, Pa., lately devised a machine for moving the iron at the rolls, which is similar in principle to Mr. Borsig's, but quite different in design. He uses hydraulic in preference to steam pressure, and applies it from beneath, but applies it directly to lift the united weight of the iron and tables, as Mr. Borsig does. The tables are composed of a series of rollers which are set in motion every time the iron comes upon them, by a complex arrangement of friction and cogged wheels, for the purpose of carrying the iron into the various grooves. In order that these rollers shall all turn in the same direction, an idle wheel is interposed between each of the wheels to which the rollers are attached. A peculiar arrangement is employed for giving a swinging motion to the tables, in order that an impetus may be given to the iron, sufficient to cause it to enter the rolls at each pass. The machine is rather more complicated than Mr. Borsig's, and we are unable to perceive that it is any more efficient. For a fuller and more accurate description, however, than the above, we would refer the reader to the *Engineering*, of June 12, 1874.

A very simple, ingenious and efficient lift was employed on a mill at Consett, England, as early as 1859. It was operated by steam, aided by counterweights. A small steam cylinder stood on a bracket, attached to the inside at the top of one of the housings. One boy managed the machine and two men the rolling (one of the latter, however, was an extraordinarily skillful man; in other mills three men would probably have been required). These and the buggyman were all who were in any way employed at the rolls, which, in this instance, were used for blooming purposes. The lift consisted of two shafts, parallel with and placed above the train, one directly over the center of the rolls, as shown in the sketch at A, the other, B, being placed so that the peripheries of the pulleys E and F might be perpendicularly over the grooves on the inside of the housings, which guided the motion of the table K. When the piston was forced down, the pulleys on the first mentioned shaft, C and D, gave motion to the pulleys E and F, through the chains H I, and thence through the chains I J to the table K, which at Consett was three small rollers; these were employed in order that the catcher might easily clear the iron of the middle roll while the table was ascending. A counter bal-



ance, W, was employed to relieve the steam of a considerable portion of the work to be performed, so that the latter had little more to do than to overcome the dead weight of the iron and the friction of the machine. It was only used on one side of the train, however, and was therefore incomplete; on the other side the iron was allowed to fall on fixed rollers below. (To be Continued.)

The London *Examiner* says: The British navy appears to be getting in a bad way. Whenever a couple of naval vessels chance to drift in dangerous proximity a curious sort of helplessness seizes hold upon their officers, with the result of a collision more or less disastrous. While the remembrance of what befel the *Mistletoe* and *Vanguard* through this cause still remains fresh in the public memory, two other cases are recalled, either of which might have been attended by equal destruction. Recently the *Iron Duke* got into collision with the *Black Prince* in Keyham Basin, although there were eight acres of water in which to move, and one vessel was stationary. It is a curious circumstance in connection with this accident that the *Iron Duke* is still under command of that Captain Hickley to whom the recent Admiralty Minute acted such a kind part, while the *Black Prince* is the flagship of Lord John H. S., the president of the court martial, whose finding deeply implicated Captain Hickley in the loss of the *Vanguard*. The second accident of a like nature occurred to the *Serapis*, which, on entering the *Piræus*, "lost two anchors by breaking cables, and fouled the royal yacht." Once more, when the *Prince* was leaving the *Piræus*, cables were broken in weighing anchor. Since the time of her construction, several years since, the *Serapis* has proved herself one of the most efficient transports in the service. No sooner, however, is she employed to convey the *Prince* to India than her boilers begin to prime in a very dangerous fashion, and her cables break asunder.

The city of Ahmedabad, the oldest, and at one time one of the most beautiful cities in India, is declared by the Sanitary Commissioner to have had no sanitary arrangements for several centuries past, and the earth has become so impregnated with abominations that not a drop of pure water can be obtained within the city walls, even garden plants die if watered with it.



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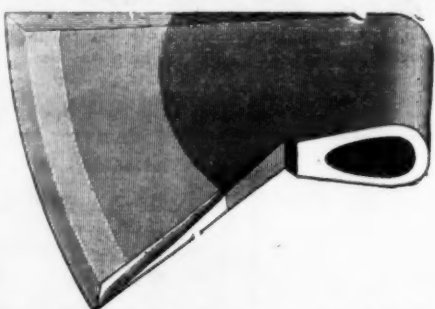
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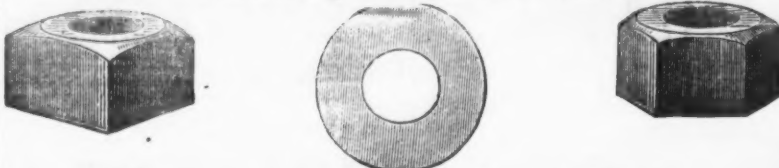


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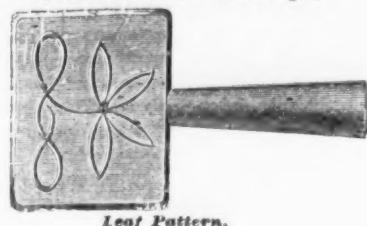
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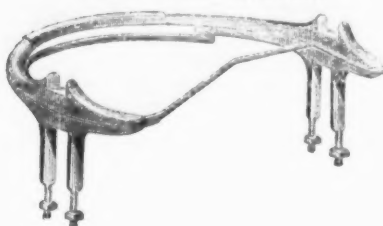


Leaf Pattern.

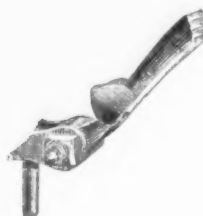
King Bolt Yokes.



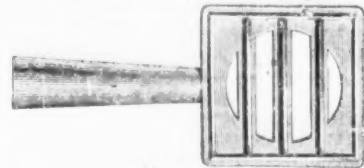
No. 6 Fifth Wheels.



1871 Pattern Shaft Couplings.



Patent Cross Bar Steps.

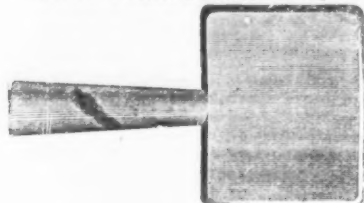


Upper View.



Lower View.

Solid Plain Pattern Steps.



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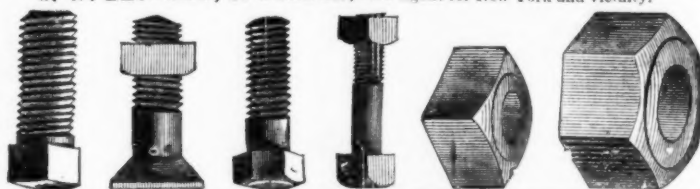
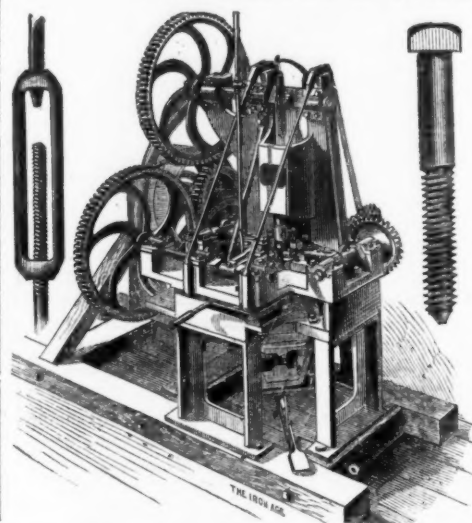
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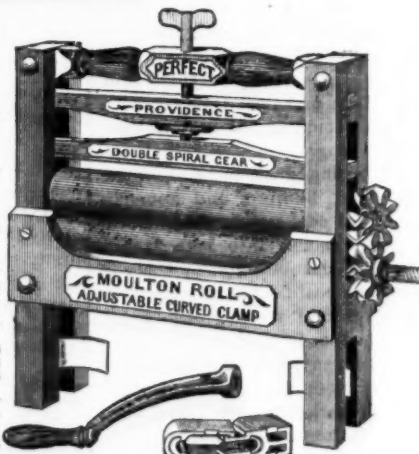
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New York, Thursday, November 25, 1875.

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JAMES C. BAYLES - Editor.  
JOHN S. KING - Business Manager.

New York, January 2, 1875.

Until the 1st instant the postage on newspapers was paid by subscribers at the office where the paper was received, the yearly rates on the different editions of *The Iron Age* being as follows: Weekly, 40 cents; Semi-Monthly, 40 cents; Monthly, 24 cents. Under the provisions of the new postal law, which went into effect on the 1st instant, prepayment at the office of mailing is required, at the rate of two cents per pound for the Weekly, an "three cents per pound for the Semi-Monthly and Monthly, which will make the postage as follows on the different editions: Weekly, 50 cents; Semi-Monthly, 30 cents; Monthly, 15 cents.

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## The Pennsylvania Geological Survey.

The progress of the geological survey of Pennsylvania, under the direction of Prof. Lesley, State Geologist, has been rapid and productive of information of great importance to the industries of that State. One branch of the survey has been prosecuting its labors in the Broad Top Mountain district, Huntington county, under Mr. C. A. Ashburner, geologist, and C. E. Billin, topographer, and with results of the first scientific and economical value. This district comprises, as is known, the location of the semi-bituminous coals of Southwestern Pennsylvania, and embraces an area of about 80 square miles. In it are to be found the representatives of the principal iron ores of the interior portion of the

State, comprising fossil and hematite ores, and from which several companies are producing iron of an excellent quality. The work of this portion of the survey during the fall months has resulted in the following important results: A vertical section of about 20,000 feet of strata has been constructed, in the upper portion of which are shown 19 one inch seams of coal, which the geologist has discovered in a sandstone about 1000 feet below the workable coals of the Broad Top basin. This is a discovery of prime value, as it proves the existence of a true coal measure far below the lowest hitherto supposed to exist in Pennsylvania. The section also shows the alternation of rocks traced from the auroral limestone, which underlies the rich wheat lands of Lancaster county, up to the valuable Broad Top coals. It also gives the relative position of the iron ores, fire clays and other strata of useful minerals found in this district, and hence will serve as a valuable guide to the miner, farmer and land holder for miles to the northeast and southwest of the location of the section. The practical value of such geological deductions is too little understood and still less utilized by the people of our country. The discovery of a mineral upon the soil of even the educated farmer or landholder of the present day is chronicled in the local press as a mysterious species of "bonanza," to which chance has directed the finder. Samples must be submitted for analysis to an analytical chemist, and the services of a mining engineer and geologist are engaged at considerable cost to discover the true economic value of the mineral. When our people are taught that a given or distinct bed or vein of ore or coal is always relatively in the same position to some prominent sandstone or limestone, any one who has the ordinary intelligence sufficient to distinguish and locate the latter can define the existence or absence of the former. The importance of such information cannot be overlooked. Millions of capital, labor and time have been spent in seeking for buried treasures where their existence was a geological impossibility. For example, we know of a well having been sunk in search of oil through strata having a dip of 35° to the horizon. Geologists prove that oil is never found in any strata but those approximately horizontal; and this intimation, applied to the previous case, at once proves its futility, and would have saved a useless expenditure of money. Instances may be enumerated of the same kind of almost daily occurrence. We hear of shafts being sunk through rock in search of coal, at least three miles below the possible locality of a coal seam, and of explorations being made in the coal measures for gold. Nor are these isolated instances; their frequency indicates the disposition to credulity among our people when any so-called mysterious value is supposed to exist beneath the surface of the soil. The importance of true and accurate information through geological surveys is here clearly evident, and carries with it, as a consequence, the necessity of the education of the people of each State to the actual existence or absence of valuable mineral deposits within their boundaries, by the dissemination of the reports of such surveys, written in the clear, positive and practical language which has ever characterized the teachings of the present State geologist of Pennsylvania. The gentlemen in charge of the Broad Top survey are now examining the coal basins of the eastern portion of the Broad Top Mountain, with prospects of a highly favorable report. The only company operating extensively in this basin, the Rockhill Iron and Coal Company, has mined this year some 40,000 tons of coal. As the survey progresses, it will reach new localities possessing great mineral value. The counties of Bedford and Somerset show deposits of coal and iron ore of the first economic value. Into both is projected the excellent bituminous coals of the Cumberland coal field of Maryland, as yet in Pennsylvania scarcely opened, but wherever mined, as in the case of the Keystone Coal Company, showing an abundance of the very best iron working fuel for which a ready market is open. In Somerset county, during the present summer, have also been discovered veins of nickel and cobalt ore, showing richer samples than are usual east of Missouri. To show the necessity of a geological survey here, some of this ore was tested during the present summer in a blast furnace, under the idea that it was spathic iron ore, the result being to scaffold the furnace and to nearly necessitate its being blown out with the corresponding pecuniary loss. Silver has also been found in veins of greater or less size—in the form of sulphurets, in the mountains of Southwestern Pennsylvania and Maryland and this region awaits the geologist to render its wealth available to our people. From a purely commercial standpoint the

value of the geological survey may be further understood. The various Boards of Trade of England have just formed an association for the protection of investors in commercial enterprises, similar to the Bondholders' Protective League. A section of this is devoted to mines and mining. Is it not likely that such a body will recommend the investment of capital in a mining region where "the testimony of the rocks," as given through the geologists, has demonstrated the existence of the minerals sought rather than in one where the report of a single and possibly interested expert has confirmed the "discovery" of a speculative land seller. We need, especially at the present, the investment of foreign capital to develop our minerals, to enable their exportation, to cheapen the production of the industrial and precious metals, and to thus enable us to compete for the world's supply of each and all of these. To obtain this capital we must lay before the capitalists of the world reliable and accurate information of the existence and possession of such mineral wealth, and, at the same time, educate our people to the knowledge of what they have. This alone can we do by widely circulated and reliable reports of the geology of the country.

## The Lesson of a Life.

The death at Washington, on Monday last, of Hon. Henry Wilson, Vice President of the United States, calls to mind the events of a life of especial interest to workingmen. He was the son of parents who were not only poor, but who lacked the industry and ambition to improve their condition, so that his early training and associations were anything but favorable to the cultivation of qualities of mind and heart which made him conspicuous in after life. At the age of ten he was bound to a farmer, and during the succeeding eleven years he had only about twelve months of schooling altogether. At the end of his apprenticeship he walked to Natick where he learned the shoemaker's trade, and in two years earned enough to enable him to take an academic course. Three years after he returned to his trade, and worked at it and his studies industriously and faithfully. In 1840, at the age of 38, he entered political life, impelled by a sense of duty to aid in righting what he believed to be a great public wrong, and advancing step by step his career culminated in his election to the Vice-Presidency in 1872.

Mr. Wilson's career shows how a man with good natural intelligence and a desire to improve his condition in life, may overcome all the obstacles of obscure birth and the severity of a long apprenticeship to an uncongenial employment, and make for himself a place in society which others, less firm in purpose or honest in endeavor, will look up to with envy. A man does not need to be a successful politician to realize an honorable ambition in life. Had Mr. Wilson's life turned in other directions he would have elevated himself far above the social place in which he was born, and in which he found himself forced to remain until he had reached the prime of life. Every intelligent young workman, ambitious of success in life and willing to fit himself for success by self-improvement, may make for himself a position of honor and independence. He may always remain a mechanic, and he could rarely find a more honorable and useful occupation than that for which he has especially fitted himself, but the measure of his success in life, judged by any accepted standard, depends upon the cultivation of his mind, the acquisition of useful and varied knowledge, and the formation of habits of industry, honesty, frugality and thrift, without which the fruits of labor are likely to be wasted without benefit to the individual or to society. In this country a man is pretty sure to be rated at his value. There are no social prejudices to be overcome, no strong or deeply rooted as to hold down a man who has in him the determination to rise. Mr. Wilson did not owe his success in life to brilliant talents or exceptional opportunities. His genius was simply an ability for close application. He was not a fine speaker nor a fluent writer, but he was a man of sterling worth, and the example of his long and useful life, crowned with honors at the close, may be studied with profit by young men beginning, as he began, at the foot of the social ladder.

On another page we publish the second part of a very interesting and valuable series of articles on the mechanical and financial management of foundries and workshops for the manufacture of architectural iron castings. The growing importance of this business, and the prospect of its active revival as soon as we shall witness a return of activity in general business, give interest and value to such practical information concerning the ju-

dicious establishment and successful management of architectural iron works as Mr. Fryer is giving in his articles. Much of this information, especially that presented in tabular form, has never before been given to the public. Mr. Fryer discusses the subject from personal knowledge, and we are assured that his estimates and calculations will bear the most careful examination.

It is scarcely necessary at this time to call attention to the concluding chapters of Mr. Wm. Hewitt's valuable series of articles on "The construction and management of roll trains for the manufacture of heavy bars, rails and girders." These articles have been read with much interest and appreciation.

The illustration on our first page this week, with its accompanying description of the construction of a Belgian coke oven adapted to American practice, is timely and interesting to furnace owners. These ovens, built for the Cambria Iron Co., at Hollidaysburg, Pa., are similar in construction to those in which Messrs. Bancroft & Rader, of the Vinton Furnace, are making excellent coke from the coals of the Hanging Rock region, after washing them to remove the slate and sulphur. In our judgment, the future of iron manufacture in the South depends, in great degree, upon the manufacture of cheap coke from the coals of the district in which the furnaces are located. We have no doubt that, with careful washing, coke of good quality could be made from the slack and waste of the Southern mines at a price which would admit of their profitable sale to the coke furnaces at five cents per bushel. As stated in the letter of a correspondent, published elsewhere, the coke furnaces in the neighborhood of Chattanooga have been paying 10½ cents per bushel for coke, which, owing to the present limited consumption, is now down to eight cents. On this subject we shall speak more fully hereafter.

## Report of the Inspector General of Steam Vessels.

The report of the steam inspection service is brought down to the end of the fiscal year June 30, 1875. The service at that date consisted of a total of 103 officers and clerks, as follows: The Supervising Inspector General, Burnett, resident at Washington; 10 supervising inspectors; 36 local inspectors of boilers; 36 local inspectors of hulls; 8 assistant local inspectors of boilers; 4 assistant local inspectors of hulls; 8 clerks to local inspectors. The following table shows the steam vessels inspected:

Divisions.	Steamers.	Tonnage.	Officers.
Atlantic coast.....	1,676	486,830.93	5,428
Pacific coast.....	231	69,592.11	890
Western rivers, including.....	14,571		
Southern coast.....	1,139	252,240.12	5,598
The Great Northern Lakes.....		189,488.66	2,655

The following is a recapitulation of the business of the Bureau for the year:

Total number of steam vessels inspected.....	3,885
Total tonnage of steam vessels inspected.....	1,018,151.82
Total number of officers licensed.....	14,571
Total receipts from all sources.....	\$360,944.75
Total expenditures.....	\$12,392.02
Balance of receipts not expended.....	\$348,552.73

The number of accidents which resulted in loss of life were: Explosions or accidental escape of steam, 14; fires, 6; collisions, 5; snags, wrecks and sinking, 11; making a total number of accidents 36. The number of lives lost during the last fiscal year was 405, namely: From explosions, 51; fire, 273; snags, wrecks and sinking, 64. The Superintendent says: "To our own citizens the loss of life for the same period has been only 201, which is an unusually small number. While there were 36 disasters to steam vessels by which life was lost, a single one of these resulted in the loss of more than half the lives here recorded, viz.: the burning of the steamship Japan at sea off Swatow, China, by which 200 Chinese and four other persons were destroyed. There were 14 cases of explosion or accidental escape of steam, one of which resulted in the death of 20 persons and another 6, while only 25 persons were lost by the remaining 12. There were six burnings of steamers by which life was lost; 204 were lost by one of these, and 45 and 20, respectively, by two others, while only four persons were lost by the remaining three."

The question whether this inspection service, maintained at a cost of \$360,944 per annum to the owners or officers of vessels, is worth what it collects in fees and license charges, is one which naturally suggests itself to the reader of Mr. Burnett's report. The burning of the City of Waco in the harbor of Galveston and the loss of the Pacific off the northwest coast would seem to indicate that our inspection is not worth all it costs. Each of these accidents at the end of the year counts as only one in the list, and so, when the grand total is obtained, these cases in which gross carelessness has caused the loss of valuable human lives are forgotten. Public attention is, for weeks, attracted by the cry of racing steamers in

the East River, and after careful investigation, we find that it was a case of boats making regular trips at the regular times, with a pressure of steam below that which they were, by law, allowed to carry. The City of Waco, apparently sound, and with a safe cargo sanctioned by the proper authorities, who could have known all about it, goes to sea and is burnt with all on board the night she reaches port. And why, simply because it pleased the owners to carry oil, and nobody cared to look where it was put on board and forbid its shipment. The law is plain enough in such cases, and there is power enough to prevent violation. But there are reasons why it is not best to prevent any such abuses. Human life may be in danger if the violation of law does take place, but the ring would be in danger if the law was executed, so the law becomes a dead letter. We have heard of vessels recently repaired condemned for some trifling imaginary flaw, yet inspected and allowed to go to sea when some patented improvement, applicable to some other than the condemned part, was adopted. Within a year or so a tugboat well known about the harbor attempted to go outside of Sandy Hook in moderately rough weather. The result could have been foretold by the inspector if he had really inspected her. She went down, and, if we remember rightly, several men were lost. The most casual observer knew that the boat was old and probably unseaworthy, yet she is allowed to run year after year, but nobody is responsible. What results are we to expect when the steamers now running get a little older? The recent stagnation in the shipbuilding line, combined with the growing demand for vessels, will cause the older vessels to be kept in service as long as they will float, and we see nothing in the present inspection system to give us any security against frequent and fatal disasters. If the government would assume no responsibility, but would fix it upon the owners of vessels, leaving them free to adopt such precautions as they might deem fit, the problem would be solved, and we should have few accidents of this kind to record.

## The Improved Condition of the Lead Market.

Whenever the European powers increase their preparations for war, the condition of the lead market immediately improves. This year Russia has been arming on an extensive scale, and is supposed to have withdrawn not less than 15,000 tons of pig lead from the markets of Western Europe since January 1. When these purchases, and those of other warlike powers, were making, the European lead markets steadily advanced, but as soon as any considerable part of the metal thus withdrawn was replaced, they rapidly declined.

Up to within a fortnight ago, the American markets have remained very sluggish, tending steadily downward; but when it was rumored that our government was about arming, or at least increasing the scale of its naval preparations, lead became firmer and, to some degree, buoyant. Not that we know of any purchases actually made for government account; but the fact that something in the way of armament was going on seemed to suffice, and since then 2400 tons have changed hands. Statistics of lead production have since been in demand, and we have taken some pains in procuring a fair estimate of this year's output of our mines. Last year's lead movement, as given in our columns early in January of the current year, was as follows:

1874.		Tons.
Imports at Atlantic ports.....		18,000
Sales by government.....		4,000
Missouri product.....		15,000
Iowa, Illinois and Wisconsin.....		5,500
		20,500

DESILVERIZED.		Tons.
In California.....		8,000
In Salt Lake City.....		3,500
In Omaha.....		5,000
In Chicago.....		2,300
In New York, Philadelphia and Newark.....		6,500
In St. Louis.....		26,000
Total supply.....		69,500

The statistics for this year, estimated from the best data obtainable, may be given as follows:

1875.		Tons.
Imports at Atlantic ports.....		11,000
Sales by government.....		1,000
Missouri product.....		16,000
Iowa, Illinois and Wisconsin.....		5,500
		21,500

DESILVERIZED.

In California.....	6,000
In Salt Lake City.....	3,500
In Omaha.....	10,000
In Chicago, New York, Philadelphia, Newark and St. Louis.....	10,000
Total supply.....	69,500

This estimate is regarded by the best authorities in the trade as liberal, if not excessive. Assuming it to be approximately correct, however, there would be a deficiency at the end of the year of 9000 tons, as compared with 1874. The building and plumbing trades being duller this year than they were in 1874, and the fall demand for spot sluggish, both dealers and consumers perceiving the declining tendency of the lead market, have laid in but moderate



supplies; but in spite of this lead is now scarcer at the various centers throughout the United States than it has been at any time since January 1.

Should the market, therefore, retain its present firmness, or advance a trifle, dealers and consumers would be likely to show some anxiety to anticipate requirements during the winter months for their spring trade, and as much of the bullion coming from the West is being turned into corroding lead, common domestic would, under such circumstances, be likely to be in brisk demand at gradually rising figures, even supposing that the government did not purchase a pound. Whichever way we look, therefore, the situation promises to be more favorable to holders.

#### Tin Plates and Solder.

The effect of a material reduction in the supply of Straits tin, which, as we showed last week, will result from the insurrection in Malacca, should the British be unable to cope with it in the beginning, will undoubtedly be felt before long in an advance in the prices of tin plates and solder. Tin plates are now nearly as low as at any time since the panic, as will be seen from the following comparison of gold prices of ordinary brands in this market:

	Nov. 23, 1875.	July 1, 1875.	July 1, 1874.
Charcoal	\$7.37 1/2	\$7.50	\$8.25
Bright	\$7.37 1/2	\$7.50	\$8.25
Charcoal	\$7.37 1/2	\$7.50	\$8.25
Bright	\$7.37 1/2	\$7.50	\$8.25
Charcoal	\$7.37 1/2	\$7.50	\$8.25
Bright	\$7.37 1/2	\$7.50	\$8.25
Charcoal	\$7.37 1/2	\$7.50	\$8.25
Bright	\$7.37 1/2	\$7.50	\$8.25
Charcoal	\$7.37 1/2	\$7.50	\$8.25
Bright	\$7.37 1/2	\$7.50	\$8.25

At last accounts the price of bright charcoal plates in England was twenty-six shillings, making the cost of importation about \$8. gold. The jobbing demand is fair, consumers are known to hold comparatively light stocks, and most of the plates in the market are concentrated in the hands of dealers at the ports. The absence of an agreement among the latter is, therefore, the only cause which can be assigned for the present low ruling of prices in this market. The exportations from Great Britain for the first nine months of the current year were 1,105,949 boxes, against 928,529 for the same time last year; 1,071,460 in 1873; 1,163,088 in 1872, and 1,033,656 in 1871. Solder is in brisk demand at 13 1/2 c., currency. This is three-quarters of a cent above the lowest, and half a cent below the highest quotations since the first of January.

The Secretary of the American Iron and Steel Association announces that he is about to prepare two books which are to have especial interest and value in connection with the Centennial Exhibition. One of these will be a directory of the iron works of the United States, as complete as such a work can possibly be made. The other will be a volume of statistics of our production, consumption, imports and exports of iron and steel from the earliest years of which statistics are obtainable, to the present time. As only half a year remains in which to complete this task, we hope Mr. Swank will receive the cordial and prompt assistance of all iron masters. It is very desirable that the work shall be done well, and we have no fears on this score, unless the difficulties in the way of procuring exact information shall be practically insurmountable. We wish Mr. Swank all success in his laudable undertakings, and bespeak for them the approval and generous appreciation of our readers.

#### Scientific and Technical Notes.

**NEWSPAPERS IN AUSTRIA.**  
In 1873 there were only 866 periodicals published in Austria, an increase of 51 since 1867. Of these 413 were professional, 267 political, 143 were devoted to belles lettres and 43 to advertising.

#### A DEEP SHAFT.

The Adalbert shaft, at Pribram, has recently reached the enormous depth of 1000 meters (3280 feet), which is 472 meters below the level of the Adriatic. This is one of the deepest shafts in the world.

G. A. Hirn has recently made a series of experiments to determine

**THE STRENGTH OF VARIOUS KINDS OF WOOD.**  
The pieces tested were 1-1/2 inches square, having a cross section of 1-3/4 inches. They were clamped between two clutches, and torsion applied by weights acting on a lever arm 39 1/2 inches long. The oiled woods were placed for two or three days in a bath of rape seed oil heated from 176° to 212° F., and afterward cut down to the standard size. In almost all cases this resulted in considerably increasing its strength, so that with the single exception of elm (No. 6), where the strength fell off by oiling from 2025 lbs. to 1820 lbs., may have been due to other causes. The relation of strength to specific gravity shown by the following table, is very striking. Comparing the figures which correspond to the best cast iron (0.625), with the comparative strength of the weakest wood (poplar, 1.291), it will be seen that in many cases wood can well come into competition with iron. In the following table are collected the figures obtained by Hirn with different kinds of wood, and at the close, analo-

gous values of two kinds of cast iron, reduced to pounds:

No.	MATERIAL.	Specific Gravity.	Breaking weight on lever arm 39 1/2 in.	Relative strength with poplar as 1.	Relative strength of 1 lb. of material.
1.	Poplar wood.	0.332	332.2	1.000	1.291
2.	" oiled.	0.332	332.2	1.000	1.291
3.	" oiled.	0.332	332.2	1.000	1.291
4.	" oiled.	0.332	332.2	1.000	1.291
5.	" oiled.	0.332	332.2	1.000	1.291
6.	" oiled.	0.332	332.2	1.000	1.291
7.	" oiled.	0.332	332.2	1.000	1.291
8.	" oiled.	0.332	332.2	1.000	1.291
9.	" oiled.	0.332	332.2	1.000	1.291
10.	" oiled.	0.332	332.2	1.000	1.291
11.	" oiled.	0.332	332.2	1.000	1.291
12.	" oiled.	0.332	332.2	1.000	1.291
13.	" oiled.	0.332	332.2	1.000	1.291
14.	" oiled.	0.332	332.2	1.000	1.291
15.	" oiled.	0.332	332.2	1.000	1.291
16.	" oiled.	0.332	332.2	1.000	1.291

We find in the *Polytech-Centralblatt* the following statement of Troost and Hautefeuille in regard to the

**ABSORPTION OF GASES BY SPIEGELEISEN.**  
Spiegelisen, when in a fluid state, contains occluded within it a much larger amount of hydrogen than ordinary charcoal iron, and up to the very moment of solidification is covered with a film of burning gas. The presence of manganese in a cast iron considerably increases the solubility of hydrogen in it, but reduces its solvent power for carbonic oxide, as shown by the following analyses of the gas from 500 grains of ordinary charcoal cast iron (a) and Spiegelisen (b.):

	a.	b.
Carbonic acid	0.6	0.0
Carbonic oxide	2.8	0.0
Hydrogen	12.3	27.0
Nitrogen	1.0	2.5
	16.7	29.5

Deby, in an article on the subject of **BESSEMER STEEL IN BELGIUM**, says that the Bessemer pig made from Spanish and Algerian ores contains on an average 2.25 per cent. silicon, 4.50 carbon, 0.04 sulphur, 0.06 phosphorus, 3.75 manganese and 8.94 iron. For each 100 lbs. of pig iron they take 110 lbs. of coke, and two-thirds of the manganese in the charge enters the iron with a blast of 1100° F.; the product equals 49 per cent., lime added as flux, 23.5 per cent. The pig is drawn off into a ladle and brought to the converter by the aid of a crane; the steel is finished in 15 to 22 minutes. About at the middle of the decarburization they throw in 10 to 25 per cent. of rail ends, according to the temperature of the mass, and at the end Spiegelisen is added. The spectroscopic is used to indicate when the end is reached, and also the quality of the slag and the malleability of a grain of the sample taken. A citron yellow colored slag corresponds to steel with 0.75 per cent. and more of carbon; orange yellow, 0.60; light brown, 0.45; dark brown, 0.30; bluish black, 0.15. The ingots are taken from the casting ditches, which are 10 meters long and only 90 centimeters deep, to the hammer. There are 100 tons of ingots per ditch produced every 24 hours. Direct casting has the following advantages: There is less waste of iron, a saving of fuel, less expenditure of labor, the product works better and the steel is tougher. The ingots are converted directly into rails, and only 36 hours are required to obtain a rail from the ore.

According to Brachelli the **ANNUAL METALLIC PRODUCTS OF EUROPE** by weight are as follows:

Gold	15,180 lbs.
Silver	2,255 "
Copper	660,000 "
Iron	451,500 cwt.
Lead	1,250,000 "
Zinc	5,940,000 to 6,600,000 lbs.
Aluminum	11,600,000 cwt.
Cast iron	528,000,000 "

There was also produced:

Mineral coal	9,627,300,000 cwt.
Salt	451,000,000 "
Manganese ore	3,555,240 "
Antimony ore	12,540 "

A recent number of the *Industrie Zeitung* contains the following in regard to

**LEAD IN DRINKING WATER.**

It is well known that a greater or less amount of salts in water modifies its power of dissolving lead. In general it has been shown that the softer the water, i. e., the less lime and magnesia it contains, the greater its disposition to dissolve lead. As the water supplied through pipes to the city of Nuremberg possesses but little hardness, it was naturally supposed that when lead pipes were employed the water would show a considerable quantity of lead. This supposition was confirmed by the experiments of Dr. R. Kayser, of Nuremberg. Water which had to pass through a lead pipe which had been in use seven months, contained 550 milligrams of lead in a hekgoltner (= about 1.30 grain to the gallon), when it stood all night in the pipe. Hence its solvent power was not inconsiderable, and might be worthy of attention, since lead compounds are of such a nature that they are less dangerous given in large doses at once than when repeated for a long time in smaller doses.

#### LUBRICATORS.

Jacobs, in France, has invented and patented two new lubricators. The first consists of 35 parts graphite, 25 parts soapstone or asbestos, 20 parts sulphur and 20 parts wax or paraffine. The second consists of 30 parts graphite, 15 parts bone glue, 33 parts water, 12 parts sulphur and 11 parts wax or paraffine.

#### A GILT VARNISH FOR METALS.

A beautiful varnish for imparting a gold color to metals has been made by dissolving a sufficient quantity of picric acid in shellac varnish, and adding to it about one-half per cent. of

crystallized boric acid previously dissolved in alcohol. It is said to be distinguished for its great hardness and beautiful color.

#### A NEW WHITE ALLOY.

Marlie's new unoxidizable alloy has the following composition: Iron, 10 parts; nickel, 35 parts; brass, 25 parts; tin, 20 parts; zinc, 10 parts. The castings made of this alloy are immersed, while white hot, in a mixture of 60 parts sulphuric acid, 10 parts nitric acid, 5 parts hydrochloric acid and 25 parts of water.

M. L. Troost and P. Hautefeuille have recently presented to the French Academy some interesting notes on

#### MANGANIFEROUS CAST IRON (SPIEGELEISEN).

While ordinary cast iron emits sparks when run from the furnace, and only gives off occasional bubbles of gas during its cooling, iron containing manganese evolves such a large amount of combustible gas that upon the surface of the metal while flowing from the furnace is a sheet of burning gas. While the iron is cooling the gas is discharged in numerous jets. The experiment can be tried in a reverberatory furnace of lime, such as is employed for the fusion of platinum. Two hundred grammes (7.054 oz. avoirdupois) of Spiegelisen, melted in the reducing flame, and, after fusion, we add 100 grammes (3.527 oz.) of Spiegelisen, which melts rapidly without refining. If the bath of metal be now exposed to view it seems to shine like silver, and upon its surface is seen a sheet of flame consisting of burning gas. During the solidification a bubbling attended with disengagement of hydrogen is observed. When the same bath has been subjected to a prolonged refining process, the effect of which is to burn away the greater portion of the manganese, then only those phenomena are presented by the metal as are seen in the case of ordinary cast iron. Iron containing manganese retains after solidification much more hydrogen than cast iron. A specimen of each kind of iron weighing 500 grammes (17.635 oz.), heated in a vacuum to 1472° F., gave off the following quantities of gas:

	Charcoal.	Spiegelisen.
Carbonic acid	0.6	0.0
Carbonic oxide	2.8	0.0
Hydrogen	12.3	27.0
Nitrogen	1.0	2.5
	16.7	29.5

The carbide of manganese takes up much more hydrogen than iron carburized to the same degree. It is seen, then, that the presence of manganese in cast iron increases materially the occlusion of hydrogen, and diminishes that of carbonic oxide.

#### Observations upon the Puddling Process.

BY S. M. BURTON.

The analysis by Messrs. Calvert and Johnson of the chemical reactions taking place in the puddling furnace, are quoted in almost all metallurgical works, but so rarely in the full and satisfactory manner as contained in Dr. Hartmann's "Waltund Puddelmuster," that a translation of the same will be of interest. Messrs. Calvert and Johnson were amongst the earliest (1856) investigators of this important subject, and made their determinations in the only satisfactory manner possible, viz., by taking out from the furnace samples of the iron and slag, or clinder, at different periods of the process, and on analysing them presented an approximate idea of the reactions taking place at those different stages. I also take this opportunity of correcting an error that appeared in a previous article, when speaking of using clay in the "fixing" of a puddling furnace, clay only being used on the bridges, not on the sides, where it would be apt to injure the iron by falling into the bath.

The pig iron used in this investigation was a gray pig from Staffordshire, No. 3, of a good quality (cold blast), such as is used for the manufacture of iron wire. Its constitution was as follows:

	1st Analysis.	2d Analysis.	Average.
Carbon	2.320	2.230	2.274
Silicon	0.270	0.270	0.270
Phosphorus	0.080	0.070	0.075
Sulphur	0.018	0.028	0.023
Mn. & Al.	traces	traces	traces
Iron	94.059	94.059	94.059
	100.047	99.957	100

224 lbs. of this pig iron was charged in a puddle furnace, which had previously been cleaned by wrought iron scrap, on the 4th of April, 1856, at 12 o'clock, m.

After 30 minutes the iron began to soften and was broken up; 10 minutes later it became liquid, at which time, 12:40 p. m., the first sample was taken out from the middle of the bath by means of an iron scoop or ladle, and then poured on a stone plate to cool. Up to this time the damper had been entirely raised, but was now lowered, until the flame came out of the working door.

#### APPEARANCE OF THE FIRST SAMPLE.

The fracture resembled the original pig of the same grade, No. 3, but had also a more silver white and metallic appearance, similar to the product of the finery hearths. This change was undoubtedly caused by the sudden cooling on the cold plate, as the sample contained the same amount of carbon as the original pig metal, and, moreover, very much in the same state of combination, since graphite also appeared in the sample.

The analysis gave in 100 parts—

	1st Anal.	2d Anal.	Average.
Carbon	2.613	2.780	2.726
Silicon	0.293	0.298	0.295

These results are very interesting, showing that the iron, during the 40 minutes that it was in the furnace, had undergone two contrary chemical changes, for while the proportion of the carbon had increased, that of the silicon had quickly decreased. This noteworthy fact is still more plainly shown in the sample which the author took out of the furnace at 1 o'clock

p. m., or 20 minutes later, as is shown in the following table:

	Carbon.	Silicon.
Original pig.	2.274	2.720
1st sample, 12:40 p. m.	2.726	0.915
2d " " " "	2.905	0.197

The carbon had increased 0.632, or 21.5 per cent. of its respective weight, whilst the silicon had diminished in the large proportion of over 90 per cent. This contrary chemical change in reference to the carbon is to be ascribed to the circumstance that the body exists in the furnace in excess, and in a finely divided state, or in a nascent state, when it has, under these conditions, with a high temperature, a strong affinity for the iron. The silicon unites itself with a small portion of the iron, forming a silicate of the proto-oxide of iron, of which the slag is composed in the first period of puddling, and which also plays such an important part in the later phenomena of the process. The second sample, taken out at 1 o'clock, gave the following result on analysis:

	1st Anal.	2d Anal.	Average.
Carbon	2.910	2.900	2.905
Silicon	0.226	0.168	0.197

It had the same white, silver-like appearance as No. 1, but differed from it in being slightly malleable when hot, whilst No. 1 was brittle. The clinder remained after cooling on the surface, and not mixed with the metallic iron, as in the next sample, which was taken out five minutes later—1:05 p. m.

The entire bath now began to swell (owing to the formation of CO in the interior), when the third portion was scooped out. The third sample was entirely different in appearance from the others, as it consisted of small rounded grains, which hung upon each other and were mingled with slag. The mass was, therefore, not compact like Nos. 1 and 2, but light and spongy. The outer appearance was black, the small grains showing a strong metallic lustre when broken; also proving very brittle when struck with a hammer.

The separation of the iron grains from the slag proved a matter of considerable difficulty, and it was only accomplished by long continued grinding, when the slag separated as a very fine powder, which was removed through a sieve. The iron cleaned in this manner gave the following result:

	1st Anal.	2d Anal.	Average.
Carbon	2.468	2.421	2.444
Silicon	0.188	0.300	0.244

The fourth sample taken out at 1:30 p. m. The damper was partially raised when the third sample was taken, so that a weak stream of air was admitted sufficient to remove the smoky flame issuing from the working door, and produce a clear, strong flame. The object of this was undoubtedly to accelerate the oxidation of the carbon contained in the iron, and to effect this still more, the puddler rapidly and thoroughly stirs the entire bath. Under these circumstances the mass swelled until it increased at least four or five times its original volume, and the bath was then on the full boil at 1:20 o'clock, when the fourth sample was taken.

During the cooling of the same, small, blue flames broke forth, without doubt the consequence of the combustion of the carbon through the oxygen of the atmosphere. This appearance, which was not observed in the previous samples, is probably due to the following causes:

First—That the casting, after that it is changed by the boiling into a finely-divided state, offers a greater surface to the influence of the oxygen of the atmosphere, whereby the union of the carbon of the iron with the oxygen is favored; second—at this period the carbon does not seem to possess but little or any affinity for the iron, as the author has often observed in the puddling of graphite gray pig, that the carbon is rendered free from the iron, for if one dips a cold iron rod in the melted mass it covers itself with iron and a quantity of glancing scales of graphite carbon.

The outer appearance of this sample was interesting in the highest degree, as it was so light and consisted of such small grains that it resembled an ant's nest. The parts had no adherence to each other, but the mass fell apart with ordinary handling. This was caused by the iron particles being intimately mingled with slag. The iron grains appeared outwardly black, and were very brittle under the hammer. Its fracture was lustrous, silver white and metallic. The slag was separated in the same manner as with the last sample (No. 3). The quantity of carbon and silicon contained are given below.

	1st Anal.	2d Anal.	Average.
Carbon	2.335	2.325	2.330
Silicon	0.187	0.178	0.182

Fifth sample, taken out at 1:35 p. m. This trial is a very important one in the series, as in this one the iron was first malleable, and allowed itself to be beaten smooth by a hammer, while hot. It was scooped out directly as the boiling ceased, as the swollen mass began to sink. The damper was lowered so as to produce a thick, smoky flame in the furnace, whilst the puddler begins to form the balls. (I suppose Messrs. Calvert & Johnson include in this the "turning of the iron."—TRANSLATOR.) The appearance of this sample when cool was similar to Nos. 3 and 4—that is, spongy and brittle, like No. 4, and separated grains intermingled with slag, like No. 3. Analysis showed that the iron had lost a great part of its carbon in the quarter of an hour that had elapsed since the taking out of the fourth sample, amounting to some 30 per cent. of its weight, whilst the silicon remained almost the same.

Sixth sample taken out 1:40 p. m. The reason for making another assay, only five minutes after the other, was due to the entire contents of the furnace dividing itself quickly into two different products; that is, slag and rounded grains of malleable iron. The authors placed some importance to this assay, as it was at this time that the puddler began to form his balls, which, after being squeezed, are rolled into

bars. Whilst the sample was cooling, blue flames of carbonic oxide broke forth, as was similarly observed in Nos. 4 and 5, but not in the same profusion. The outer appearance of the assay was very similar to the last, with the exception that the slag was not so intimately mingled with the iron grains, which were also larger, and with hammering weakly welded together. The contents in carbon and silicon were as follows:

	1st Analysis.	2d Analysis.	Average.
Carbon	1.233	1.160	1.206
Silicon	0.167	0.160	0.163

By comparing these numbers with the previous analysis, one sees that whilst the silicon remains almost unchanged, the contents in carbon have quickly decreased, since in the five minutes that elapsed the carbon has decreased about 28 per cent. of its weight. This rapid loss of the carbon continues for the next ten minutes, as the iron loses in a quarter of an hour from 1:35 to 1:50 p. m. 50 per cent. of its carbon, which it contained at 1:25 p. m.

Seventh sample taken out at 1:45 p. m. This was taken as the puddler began to form his balls. The outer appearance was similar to the last except that the grains were larger, and more separated from the slag, which formed a layer above and below the mass. The iron grains were much more malleable, since they were easily beaten flat under the hammer. The latter fact is explained by the smaller contents in carbon.

	1st Analysis.	2d Analysis.	Average.
Carbon	1.000	0.927	0.963
Silicon	0.160	0.167	0.163

Eighth sample, taken out at 1:50 p. m. This was taken a few minutes before the balls were removed from the furnace, in order to be squeezed under the hammer. During the cooling of this assay no blue flames were observed. The outer appearance showed the balls were still spongy and granular, the only difference being that the grains held together with so much tenacity as to require a certain force to separate them; further, that they were more malleable than those of the previous samples.

	1st Analysis.	2d Analysis.	Average.
Carbon	0.771	0.773	0.772
Silicon	0.170	0.167	0.168

The authors remark here that the black coating of slag that covered the grains completely protected the iron from oxidation during the nine months that this sample remained in the laboratory exposed to the acid vapors impregnating the atmosphere. The coating probably consists of one of the salts of the oxide of iron.

The ball was taken out of the furnace and squeezed by means of a hammer, in order to remove the fluid slag enclosed and to weld together the particles of iron. The bloom was then rolled out to a bar, which gave the following analysis:

	1st Analysis.	2d Analysis.	Average.
Carbon	0.291	0.301	0.296
Silicon	0.130	0.110	0.120
Sulphur	0.132	0.126	0.129
Phosphorus	0.139	0.139	0.139

The puddle bar was cut into lengths of four feet, and after being brought to a white heat in a furnace, was rolled out in wire iron, which then contained:

	1st Analysis.	2d Analysis.	Average.
Carbon	0.100	0.122	0.111
Silicon	0.095	0.082	0.088
Sulphur	0.098	0.096	0.094
Phosphorus	0.117	0.117	0.117

Finally, the authors determined the slag that remained in the furnace, after the withdrawing of the balls, which gave the following constitution:

Silicic acid	16.53
Protoxide of iron	66.23
Sulphide of iron	6.80
Phosphoric acid	3.50
Protoxide of manganese	0.134
Alumina	1.04
Lime	0.70

Total.....100.00

Thus the slag contains the impurities of the original pig metal, the phosphorus and silicon being probably separated out by forming a fusible union with the iron.

In conclusion, the authors placed their results together in a table, which we give below:

together in a table, which we give below :			
Sample.	Time.	Carbon.	Silicon.
Original pig.....		2.275	2.720
No. 1.....	12:40	2.726	0.915
No. 2.....	1:00	2.905	0.197
No. 3.....	1:15	2.444	0.194
No. 4.....	1:20	2.305	0.183
No. 5.....	1:35	1.647	0.183
No. 6.....	1:40	1.206	0.168
No. 7.....	1:45	0.683	0.168
No. 8.....	1:50	0.772	0.168
Puddle bar.....		0.236	0.120
Wire iron.....		0.111	0.080



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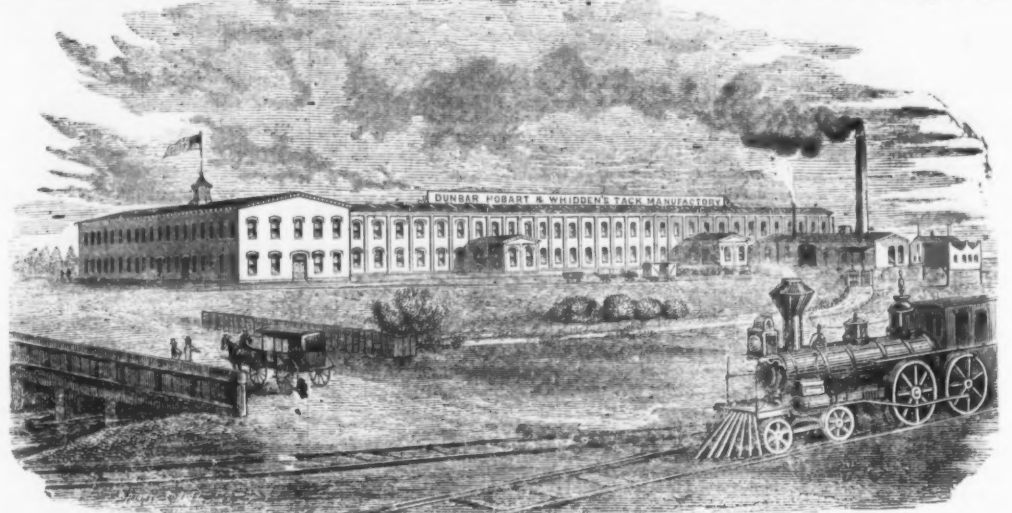
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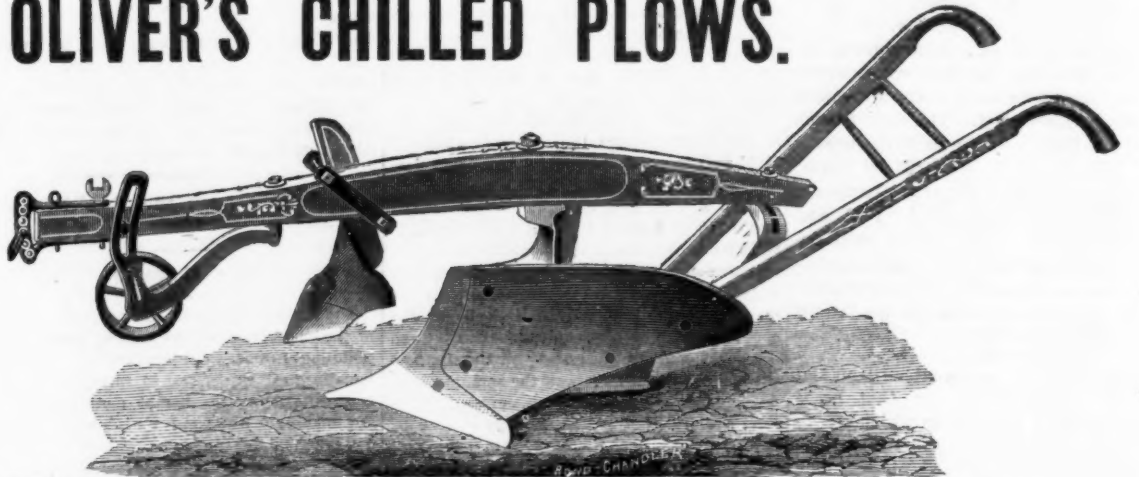
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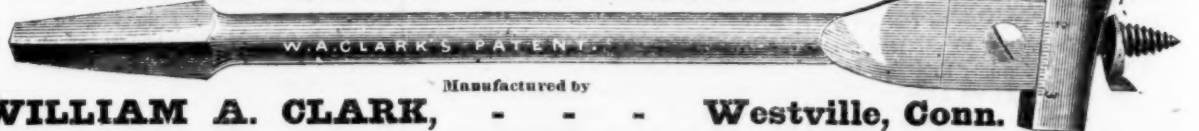
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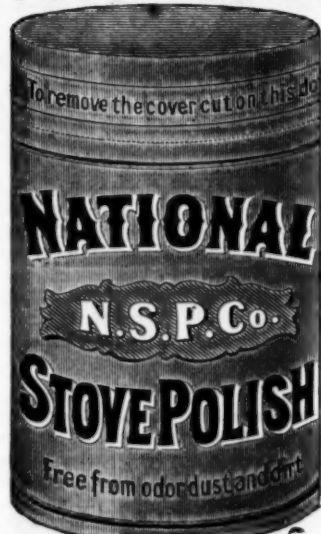


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## BUSINESS ITEMS.

## MAINE.

The Evans Rifle Company, of Mechanics Falls, propose to manufacture still another style of magazine arm, one to carry the United States regulation cartridge of 70 grains powder, and 45-100 calibre, of which their patent magazine will carry 23 rounds, no other arm carrying more than seven of their ammunition.

About five millions of bricks have been made in Lewiston the present year—about half as many as usual. There are from three to four millions now on hand. The Franklin Company has quite a heavy stock.

## NEW HAMPSHIRE.

The largest casting ever made in Belknap county, and one of the largest ever made in the State, was successfully run at the foundry of the Cole Manufacturing Company in Lake Village, a few days since. It was an anvil block for the steam hammer in their forge, and weighed about 5500 pounds.

The Amoskeag Mills, at Manchester, have given notice to workmen of a reduction of from five to fifteen per cent. in wages.

## MASSACHUSETTS.

Manager Prescott of the tunnel line, at North Adams, is advancing the work upon it and increasing the necessary facilities as fast as possible, and plans are being made, in his office at Greenfield, for a new iron turn table, 54 feet in diameter, to be built at North Adams, and which will be one of the finest in the State. In connection with this will be an engine house to accommodate six engines, each section to be 65 feet long, 11 feet wide at the narrow end and 25 feet at the other. The plans for the turn table have already been sent to the Phillipsburg Iron Works, which are to build it. Aaron Wright has contracted to build a Howe truss bridge at Bradwell's Ferry, to take the place of the present structure, work upon it to be begun at once. Contractor Beaumont has discharged some 50 of his workmen on the section between Bradwell's Ferry and Shelburne Falls, leaving some 75 still employed. General mason work will be continued as long as the weather will admit, and, in some places, probably all winter. The stone work of the second pier resting on piles for the Green River bridge, at Greenfield, has been finished; the remaining four piers are smaller, and will be built directly from the ground. The steam shovel was put at work recently, the trestle work for the track and the cars being ready. B. N. Farren has bought a new freight engine in Boston. It is hinted that the forthcoming report of Manager Prescott will show that since he took control twice as much has been accomplished for the same money as was done before. The feeling of those petitioning for the western location of the new depot is, that thus they will avoid the necessity of crossing the tracks of both railroads to reach the depot, as they claim would be the case with the other location.—*Springfield Republican*.

Work in the Boston and Albany car shop, at Springfield, is on the increase. A machine for pressing cold iron forgings has just been received at the Springfield water shop from Pratt & Whitney, of Hartford. It weighs 5700 pounds. The Manufacturers' Board of Trade, at Fall River, were in session a couple of hours recently, discussing the feasibility of making a market in England for their manufactures. Several moves have already been made in furtherance of the project. The introduction of a tack factory is giving an impetus to business in North Dighton. Quite a number of machines have been set at work under the supervision of Major J. J. Cooper. It is said to be independent of the combination. Capt. C. P. Weaver, of the Pennsylvania Tack Works, Norristown, is running a branch manufactory at South Weymouth, Mass., and turning out shoe and lasting tacks for the Western trade. He runs six tack machines and employs two hands, producing 355 pounds of tacks per week, being allowed to run only four days in the week by the rules of the association. The Griffin Machine Company, of Westfield, are making a Burwell & Bates friction clutch for the Farr Alpaca Mill, at Holyoke, of 300 horse power. The clutch will admit of their running different sections of their mill without running the whole. They are also running two smaller clutches for Hayden & Gere's Brass Works, at Haydenville. Fuller & Bell, of Holyoke, have received orders from Montreal for 1000 feet of their 4-inch asphalt water pipe, 400 feet to be laid on Montreal street as a test. They make about 300 feet daily, but will double or treble this amount as soon as machines can be built. The Wason Manufacturing Co., at Springfield, have a contract to build 20 box cars for the Connecticut Western Railroad. At the Knowles Steam Pump Works, at Warren, about 150 men are employed on full time. They have just put in a new 30 horse-power engine, and a 60 horse-power boiler in place of their old 30 horse one. A large fire pump, 20 inch steam cylinder, 10-inch water, and a 24-inch stroke, capable of sustaining 6 one-inch streams 100 feet high, and weighing 3½ tons, is now being constructed. A mining pump to force water from a mine 1000 feet deep has just been sent to Salt Lake City, Utah. By comparatively recent improvements, the pumps now made do away with the shock, or concussion, at each stroke. The company will send about twenty pumps to the Philadelphia Centennial Exposition. One of them is an air-pump with a 48-inch air-cylinder and stroke, which will be used to furnish air for one of the exhibitions in the chemical department.

The Rollstone Foundry, Page & Goodnow proprietors, Fitchburg, have just made castings for a large planer for C. H. Brown & Co.,

and have lately cast a pulley 16 feet in diameter with 3-foot face, weighing 10 tons. They have facilities for casting anything from 3 inches to 30 feet in diameter. They are now employing 45 men, and, beside machine castings, are turning out large amounts of building castings, such as columns, &c.

The stock for the needle factory in Middleboro, has been subscribed, and ground broken for the building. It is to be a 60x30 foot, three story building, and will employ seventy-five hands. The capital is \$40,000.

A handsome portable engine of 30-horse power to go to Brazil has just been made at the Fall River Machine Company's foundry.

One of Kilburn, Lincoln & Co.'s 68-inch turbines has just been started by Charles Allbrook, of Taunton. This foundry is at Fall River, where 150 hands are employed with a capacity for turning out five tons of castings. They are at present making shafting for the Robinson Mill, and have just finished the shafting for Stafford & Co., North Dighton and Barrowsville; also a lot of looms for the King, Philip Mill, Fall River.

The Clinton Wire Cloth Company, Clinton, have now sixty looms and are using about three tons of wire per day. The company have lately put in an Allen engine of 150-horse power. They propose to produce 8,000,000 feet of wire cloth the coming season. They have 400 hands employed, with salesrooms in New York and Chicago.

## RHODE ISLAND.

The Woonsocket Machine Company are putting in a new 60-horse power steam boiler from the Worcester Boiler Works, for the purpose of heating their entire building by steam—machine shops, old cotton mill building, etc. This will remove some half dozen large stoves from the rooms, give them better heat, less danger from fire and at less expense.

## CONNECTICUT.

The Winchester Arms Works, at New Haven, have largely cut down the number of their employees, and reduced the working time from ten to nine hours. The cartridge factory is shut down.

There are employed in the factories located in Hartford, or owned exclusively by Hartford parties, between 8000 and 10,000 men, women, boys and girls. The neighboring towns, too, Meriden, New Britain, Middletown, Waterbury, Southington, &c., all make very favorable reports as to the outlook for the winter trade. Pratt, Read & Co. shut down their mills for a few days, on Monday last, for inspection and repairs of their boilers, furnaces, water pipes, &c. This firm do not light their factory for work during the winter months, but run only as long as the daylight lasts, which in mid-winter, reduces their hours of labor per day from 10 to 8½.

The Billings & Spencer Company, Hartford, are running on full time with a full force of hands. Their orders for drop forgings for gun and pistol parts, shuttles, parts of sewing machines, and machinery generally, will keep them running for the next eight months in the forging department. They have orders in the finishing department for 12,000 finished shuttles for Germany, 15,000 for the Dominion, and standing orders for 5000 per month for two of the largest sewing machine manufacturing companies in the States. These works are among the largest and most thoroughly equipped in the country, and their machinery is kept in constant operation to meet the growing demand for the specialties made at the establishment.

A party of Englishmen have commenced the bronzing business in Wilcox, Crittenden & Co.'s manufactory, at Pamecha, Middletown, in the part formerly occupied by Simons & Miller, britannia manufacturers. The name of the concern is the Middletown Bronze and Plate Company, and they will manufacture bronze and plated ware.

A company has been organized in Middletown, under the name of the United States Reflector Company, for the purpose of the manufacture and sale of reflectors, gas fixtures, and improvements in lighting and ventilating. The capital stock of the concern is \$300,000, divided into 12,000 shares of \$25 each.

The United States Hook and Eye Company, of Birmingham, have shipped, within the past year, 750 cases, each case containing 576 boxes, and each box 6 cards, on which were 4 dozen hooks and eyes, making 124,400,000 hooks and eyes in one year.

The walls of the new factory of the Russell & Erwin Manufacturing Company, on Myrtle street, New Britain, are well advanced toward completion, the third and last story being partly up. The building has 250 feet front on Myrtle street and 40 on High street.

The Norwich Pistol Company are now running 20 hours daily, and employing two sets of hands.

The No. 3 furnace of Barnum, Richardson & Co., at Canaan, is turning out 95 tons of iron per week, and the No. 2 furnace 80 tons.

## NEW YORK.

We learn from the *Troy Times* that one of the stacks of the Crown Point Furnace is to be put out of blast, owing to some defect in the lining. This is one of the few furnaces in the country making Bessemer iron, for which there is a good demand. It is but a short time since one of the stacks was rebuilt, and it is unfortunate that the large expense is to be again incurred. The owners are, however, full of enterprise and means, and will no doubt keep up the reputation and production of the furnace.

The foundries at Peekskill, after an idleness of many months' duration, have all resumed operations, and are doing a good business.

## PENNSYLVANIA.

There seems to be a prospect that the Kittanning Rolling Mills will resume operations. The old limestone well on the McNab farm, three miles north of the town, has come into the

control of the iron men, who intend to have it cleaned out, and if sufficient gas is obtained it will be conducted to the works and used for heating purposes.

The new fire brick works at Lewistown went into operation on the 15th inst. There are large deposits of fire clay in Mifflin county.

The Chemical Copper Company, of Phoenixville, are about enlarging their works by the addition of a large building, in which will be erected a number of muffled furnaces, for reducing ores of a different quality than those now being reduced at their works. A large increase of production is expected. The Schuylkill Copper Works, of Charles M. Wheatley, Esq., adjoining the above, is in successful operation, and is turning out copper in large quantities.

During the past year the Pennsylvania Steel Works, Harrisburg, have made 23,811 tons of steel rails. They have begun the construction of a second blast furnace, two feet more in diameter than their first, which they expect to have in operation by January 1 next. With the late improvements made in the Bessemer Rail Mill, and other appendages, they now have a capacity to turn 45,000 tons of steel rails annually.

The Pottstown Iron Company have completed the improvements to their furnace, and are about to blow it in. The stack has been raised about ten feet, a new hot air blast has been erected, and other improvements have been made, which will render this one of the finest furnaces in the valley of the Schuylkill.

The Philadelphia and Reading Coal and Iron Company have contracted with the proprietors of eight furnace stacks on terms submitted by the company to the furnace men of the Schuylkill Valley. Six of these furnaces are now in full operation, and the other two are getting ready. Twenty other furnaces afterward desired to enter into the contract, but were refused by the company. But one of these furnaces was previously in blast, the other seven being out. The Reading Company buys at a stipulated price all the iron from the furnaces, which have an annual capacity of 50,000 tons. It is stated, however, that the iron produced will, under no circumstances, be sold until prices have materially advanced.

At Lebanon, G. D. Coleman has resumed operations at two of his furnaces, the third not being ready. At Cornwall, six miles south of Lebanon, Mrs. M. C. Freeman's Furnace, at North Cornwall, is in operation, and R. W. Coleman's heirs' new furnace, known as the "Bird Coleman," is also in blast. Ainey's Furnace, Lehigh county, it is reported, will soon resume operations. All the iron works in Danville, except the old National, are in full operation. The Kutztown Furnace Company, it is reported, are arranging to resume operations at an early day.

The Weimer Machine Works furnished the new 84 inch blowing engine now being constructed at the Temple Furnace. The nail factory at Sunbury is now in full operation, and Messrs. Godcharles & Co. intend to keep it running at its full capacity.

A new Siemens' furnace, of twenty tons capacity, and a new train of rolls, seventy-eight feet by thirty feet in dimensions, are being erected in the Chester Rolling Mills. Messrs. Painter & Son, proprietors of the foundry at Myerstown, are at present engaged in furnishing the hot blasts for the Mount Hope Furnace. They are also at work on the shafting and pulleys for the new planing mill at Myerstown.

The Sharpville Advertiser says: We are happy to be able to announce the blowing in of the Valley Furnace No. 2, at Sharon. A little reconstruction is needed, which is being done as fast as possible. It will be a bell top. The repairs needed are taking down about 15 feet of the lining—that will be about to the flues—and putting in a 4 foot bell. No. 1 will start as soon as she is cleaned out and a new lining put in, which will take somewhere near the holidays.

The Edgar Thomson Steel Works, running single turn last week, made 616 1690 2340 tons of steel ingots, and 507 434-2340 tons of steel rails.

The firm of Lewis, Bailey, Dalzell & Co. has been dissolved by mutual consent, A. McD. Bailey and J. E. B. Dalzell retiring. The business will be continued by the remaining members, J. C. Lewis, Robert Dalzell, and Lewis W. Lewis, under the style of Lewis, Dalzell & Co. Robinson, Rea & Co. have just shipped three pairs of large rolls for a rolling mill in Chicago. The firm has been working on this machinery over three months.

The boring for gas at the steel works of Jones, Ingold & Co., at McKain Station, near McKeesport, is down 1400 feet, and will be sunk to a depth of 2000 feet if necessary. At the depth of 750 feet gas was struck, and the tools, weighing 1400 lbs., were thrown out of the well, but the vein proved to be of small capacity, as did one found at a depth of 800 feet. The great Burns and Delamater wells, in Butler county, we believe, are 1600 feet deep.

The use of Butler county gas at the works of Spang, Chalfant & Co., and Graff, Bennett & Co., at Pittsburgh, is a complete success. The new fuel is easily managed, is very economical, and produces a quality of iron thought to be superior to that made from the same material with ordinary fuel.

Messrs. Seidel & Hastings have just completed and put in operation an additional rolling mill at their works. In this mill their stock is prepared into the necessary sizes and shapes directly as it comes from the forge, thereby effecting a considerable saving in labor and fuel, and enabling them to run their other two mills exclusively on finished plate iron. The capacity of the works is now 4500 tons of finished iron per annum, running in daytime only. These works have been running steadily to their full

capacity since February last, and have good prospects for steady work for several months to come.

Seven acres of land are said to be covered by the pig iron owned by the Allentown Iron Company and kept in stock at the company's works in that city. This is the largest stock, numbering thousands of tons, ever collected at one time by any furnace company in the Lehigh Valley.

The Baldwin Locomotive Works, at Philadelphia, are engaged in constructing a number of engines for South America.

The new rolling mill, in Reading, of the Philadelphia and Reading Railroad Company is, now running full time, with a full complement of workmen, and will continue so, at least, until the holidays.

Work will be resumed this week at Gackenbach's ore mines, in Berks county, the difficulty on account of flooding having been overcome.

Two ore beds leased by the Carbon Iron Company, and located on the line of the Catawqua and Fogelsville Railroad, have resumed operations with their usual force of workmen.

## OHIO.

Buena Vista furnace, Ironton, will make a trial of stone coal for the blast of the coming season.

The Scioto Valley Railway will be graded from Columbus to Portsmouth in about ten days.

Work at the Medina foundry has been suspended on account of the financial embarrassment of the firm.

The addition in the new Enterprise Mill, Youngstown, is about complete, the engine is up and the foundation for the rolls laid.

Bolton, Myers & Co.'s steel mills, Canton, are running day and night now, and still they find it difficult to fill their orders.

Messrs. Murphy & Davis have opened up a shop for the purpose of manufacturing and repairing boilers in a part of the Nixon & Co. shops, Alliance.

A stock company is being formed in Ashland to purchase the shops of the Ashland Machine Company, and start the works up as early as possible.

The John Cooper Iron Works, at Mount Vernon, the suspension of which we noted some weeks since, will soon start up again, a new stock company, with a capital of \$100,000 having been organized, under the name of Cooper Engine Manufacturing Company, for that purpose.

A company has been formed in Columbus for the manufacture of the woven wire mattresses.

The Ironton Iron & Steel Company are laying a gas conductor from the furnace to the boilers of the mill to utilize the gas.

The Belfont, Lawrence and Ironton Mills, at Ironton, are at work at about their full capacity.

The Jefferson Iron Works Company, at Steubenville, has been incorporated, with power to issue stock in shares of \$100.

Stepto & McFarland's machine factory, Cincinnati, was partially destroyed by fire Saturday night. The loss is estimated at \$5000.

Work on the Breakwater, Cleveland, was begun on Saturday morning, 13th instant.

The material for rebuilding the old mill of the Cleveland Rolling Mill Company, is all on the ground; it covers a large area of ground. The structure will, when completed, cost in the vicinity of \$110,000. The material is all iron.

The Marietta Iron Works have a contract for furnishing the rails, frogs and switches for 60 miles of railroad in Kansas.

Manning & Sons, of Cleveland, have the contract for casting six large cylinders, to be used for a casing for the shaft to be sunk in building the new water works tunnel. The cylinders are each eight feet long and nine feet in diameter; they are to be one and one-half inches thick in the body, and two inches at the flanges, the ends are to be turned and fitted on a lathe. They will weigh seven tons each. The casting will be begun this week, as two of them are to be delivered within 30 days.

The Cleveland Saw Manufactory, Peter Gerlach & Co., are running full. They are building a Champion stove sawing machine, the cylinder saw of which is 36 inch in diameter, and will saw a hoghead stove 46 inches long.

Akron has a contract to supply five miles of sewer pipe for Providence, R. I.

The Kent Glass Works, that have been idle for some time, resumed last week.

The Hocking Valley Railroad is now shipping more coal than at any time since 1873.

Since the location of the Baltimore and Ohio Railroad shops at Garrett City, 1000 men of that place have been employed by the company.

The Youngstown Rolling Mill Company, the Girard Rolling Mill Company, the Falcon Iron and Nail Works, and Mr. L. B. Ward, of Niles, have associated themselves and formed the "Mahoning Iron Company," and are about erecting a warehouse in this city, from which they propose selling the product of their mills and carrying on a general iron business.

The Cleveland *Trade Review* says: The Westerman furnaces, at Sharon, are both doing well now. No. 1 has got over her bad spell.

Ormsby Furnace made 238 tons of metal week before last, and the last day of the week she made 39 tons in 22 hours.

Keel Ridge Furnace, Sharon, is working up to the standard again, averaging about 30 tons a day of very good iron.

The Columbus Iron Works is running full time; the Columbus Rolling Mill (rail) is making half time on an average.

## ILLINOIS.

The nail mill at Belleville made 88,500 kegs of nails last year. The company has a paid up capital of \$200,000, and it is the intention of the directors to increase working capital by the addition of \$100,000 more, and with that sum to double their productive capacity.

## KENTUCKY.

A 50 ton fly-wheel is being put in the Norton Iron Works, Ashland, in place of the present old 40 ton wheel.

## MICHIGAN.

The fire at the Wyandotte Rolling Mill, Detroit, on the 11th inst., was confined to the plate mill, which was destroyed, but without great damage to the machinery. The total loss does not exceed \$20,000; fully insured. The remainder of the works were saved by the promptness of the Detroit fire department.

The Menominee Furnace is making about 150 tons per week. Part of the fuel used is pine charcoal. Two new kilns are in course of construction.

The Eureka Iron Company, at Wayne county, will ship 400 tons of pig iron to the Cleveland Rolling Mill Company, in a few days.

The Ward Rolling Mill Company's furnace, in Wyandotte, blew out week before last, and will not resume operations until next spring.

The Marquette and Pacific Rolling Mill Company are laying in a full stock of fuel and limestone preparatory for a winter's run. The furnace is working smoothly, turning out easily 35 to 40 tons of good iron per day. There is nothing definite known as to when the rolling mill will be started.

## INDIANA.

Articles of association of the Quaker City Iron Works were filed with the Secretary of State, at Indianapolis, Oct. 25.

The mill at Greencastle is running to full capacity, single turn.

Nelson furnace, at Shoals, was blown in on the 20th ult. Bituminous coal was formerly used for fuel at this furnace, but charcoal is now used. The stack is 60 feet high, with 13½ feet boshes.

The Ohio Falls Mill, at New Albany, is running six days in the week.

The Southwestern Car Company, at Jeffersonville, has a contract to build 75 box cars for the Erie Railroad.

New steam boilers are being put in at the nail works at Terre Haute.

The Indianapolis Rolling Mill Company has contracted to re-roll ten miles of iron rails for the Indianapolis, Bloomington & Western Railroad.

## WEST VIRGINIA.

The Norway Tack Factory, in Wheeling, has been shut down for some time, on account of the general depression in business.

## MISSOURI.

The Vulcan Rail Mill, St. Louis, after a short haul-off for change of train, commenced work again on Monday. The new Vulcan Bessemer Steel Works will be ready for a full commencement of operations by June next.

The Missouri Zinc Company, St. Louis, is running but four furnaces at present. The business is not at all pressing from any active demand for spelter.

The Missouri Furnace, Carondelet, which has been banked up for nearly three weeks will load up again in a short time. The rise in the Ohio river is no more welcome to any other possible interest than it is to the Missouri and South St. Louis Furnace people. These companies are not willing, with a long and maybe severe winter approaching, to let their workmen lay out of work, if diligence and precaution will avail anything. St. Louis is not yet independent in her furnace operations as long as fuel is procured 1400 miles away, and the most fertile of rivers the only practicable highway for its transportation.

The Chester (Pa.) *Evening News* has the following item in regard to the new steamers for the Panama Railroad Line. These vessels, on which the bid was made, are to be similar to the Pacific Mail steamship Colima. The directors of the Panama Railroad recently held a meeting in New York city to take into consideration the question of building a line of steamers to run between New York and Aspinwall and Panama and San Francisco. A committee previously appointed to ascertain what arrangements were necessary to secure the necessary steamers to form said line, reported that the interests of the company would be promoted by its owning and operating steamers necessary to run tri-monthly between New York and San Francisco and a line from Panama to Central America, which would require steamers as follows: Between New York and Aspinwall, three steamers; between Panama and San Francisco, five steamers; Panama and Central America, two. Total, ten. Cost of line: Eight steamers for through line, at about \$425,000 each—\$3,400,000; two steamers, Panama and Central American route, at \$200,000 each—\$400,000. Total, ten steamers, at \$3,800,000. On the 3d inst. the committee addressed a letter to the Pacific Mail Steamship Company, asking if that company had any desire to dispose of any of its steamers. No answer to said communication having been received from the Pacific Mail Steamship Company, the committee applied to different shipbuilders and asked for a proposition to furnish the company with the eight steamers. Mr. Roach, in his reply, offers to duplicate the Colima, of the Pacific Mail line, fully equipped and furnished, for \$425,000, and to deliver one of said steamers in six months and one on each month thereafter. He will also make a change, without extra charge, in the engines, whereby 10 per cent. can be saved in fuel and an increase of speed be secured, with a consumption of only 30 or 22 tons of coal per day. He also agrees to receive in payment half the amount in cash and the other half in the bonds of the company. Messrs. N. M. Cramp & Co., of Philadelphia, offer to build the steamers for \$450,000, and guarantee economy and speed. President Park stated that it was his intention to make the necessary contracts at once, and proceed with the building of the steamers as rapidly as possible, having the unqualified support of his board of directors and means abundant for the purpose. This being the case the Delaware River Iron Ship Works, will have plenty of work for the coming winter, a condition of affairs devoutly to be wished for.







## Trade Unions.

We present herewith an abstract of the report of a committee of the British Association for the Advancement of Science. It will be found to contain many facts and suggestions of interest to workmen and employers in this country:

Your committee appointed to inquire into the economic effects of combinations of laborers or capitalists, and into the laws of economic science bearing on the principles on which such combinations are founded, have already stated in their preliminary report, made last year, the course they have thought fit to take in order to ascertain the exact views held by both employers and employed on the subject in question. Although the general objects of such combinations, whether of capitalists or laborers, are well known, both from the written rules which bind them together, and from the action taken from time to time, your committee have deemed it desirable to come into personal contact with some representative men from both classes, with a view of finding whether they do now stand by the rules of their unions, and how far they are prepared to defend them. The points more especially inquired into were the following: (1) What determines the minimum rate of wages? (2) Can that minimum be uniform rate in any trade, and can that uniformly be enforced? (3) Is combination capable of affecting the rate of wages, whether in favor of employers or employed? (4) Can an artificial restriction of labor or of capital be economically right or beneficial under any circumstances? The chief functions of combination, whether of capital or labor, being to operate on wages, your committee were anxious to ascertain by what criterion the parties interested ordinarily judge of the sufficiency or insufficiency of existing wages. The first test of the sufficiency of wages is the relation they bear to the cost of the necessities of life. "The minimum of wages," says Prof. Rogers, "is the barest possible amount on which a workman can be maintained; that which, under the most unfavorable circumstances, a man is able to obtain." But the minimum thus estimated can only be, and is, submitted to under circumstances of extreme necessity. "I believe the minimum rate of wages," said one of the representatives of labor, "is that which under the worst circumstances the worst workman gets from the worst master." We cannot, therefore, take the minimum rates so considered as a proper basis for the sufficiency of wages. How far insufficient wages in relation to the cost of living in the United Kingdom is a cause of the large emigration which is taking place from year to year it is not possible to establish; but, doubtless, the prospect held out in the distant colonies, and in the United States of America, of considerable improvement, has been for some time past, and still is, a strong inducement to those in receipt of insufficient wages in this country to emigrate to other lands. Your committee are desirous to point out in connection with this question, that not only has the cost of some of the principal necessities of life greatly risen within the last twenty years, but that, in consequence of the general increase of comfort and luxury, many articles of food, meat and dress must now be counted as necessities, which some years ago were far beyond the reach of the laboring classes; whilst house-rent, especially adapted for the working classes, is considerably dearer. If, therefore, the cost of living be taken as a guide to the rate of wages, it would not be enough to take into account the cost of the mere necessities of life. A higher standard of living having been established, it would be indispensable to compare the wages of labor to such higher standard. Your committee are not satisfied, however, that it is possible to regulate wages according to the scale of comfort or luxury which may be introduced among the people, and are compelled to assert that it is an utter fallacy to imagine that wages will rise or fall in relation to the cost which such supposed necessities or indulgences may entail. A better test of the sufficiency of wages is the relation they bear to the state of the labor market; and, tested by that standard, the minimum rate of wages which workmen are at any time prepared to accept, is the least which they think they are entitled to have under existing circumstances, the trade unions guiding them as to the state of trade and the value of labor at the time. Unfortunately, however, what workmen think themselves entitled to have does not always correspond with what employers find themselves able to grant. Primarily, the wages of labor are determined by the amount of capital available for the purpose of wages in relation to the number of laborers competing for the same. But the amount of capital employed in any industry is itself governed by considerations of the relation of the cost of production to the market price of the produce—that is, to the price which the consumer is able or willing to give for the same; the cost of production, including the cost of materials, the value of capital, the cost of superintendence and the wages of labor. Your committee think that it is not in the power of the employer to control the proportion of the different elements in the cost of production, each of them being governed by circumstances peculiar to itself. The value of capital, as well as the value of the raw material, is regulated by the law of supply and demand, not only in this country, but in the principal markets of the world. The cost of superintendence and the wages of labor are likewise governed by the relation of the amount of capital to the number seeking to share in the different employments. The employed say: "We must have certain wages. We care for nothing else. Labor is our property. We set our value upon it. If you will have our labor you must pay what we ask for it. And if such wages should require a rise in the market price, let the consumer pay it." What, however, if the consumer will not, or cannot,

pay sufficient price to enable the employer to pay such wages? What if he can get the article cheaper elsewhere? Must not production cease if there be no market? And where will be the wages if there be no production? Nor should it be forgotten that a general rise of wages, producing an increase of the cost of all the commodities of life, reacts on the masses of the people, and thus far neutralizes the benefit of higher wages. Disagreements between employer and employed are often produced on the subject of wages by the fact that all the elements of the case are not within the cognizance of both parties, experience showing that, in making a demand for an advance of wages, or for resisting a fall, workmen are of a necessity groping in the dark as to the real circumstances of the case.

One of the chief advantages supposed to result from the organization of trade unions is the competency of their leaders to give solid and practical advice to those interested as to the condition of the labor market; and we have no doubt that this duty is, in the main, honestly performed; but it is very much to be expected that such leaders should universally possess large and liberal views enough to vindicate the exercise of their enormous power, and such constant and accurate knowledge of the multiple facts of the case as would enable them to exercise an almost infallible authority. On the other hand, were it possible for employers who are not in the dark in such matters to make known to their own workmen the grounds of the action they propose taking before the resolve is carried into execution, many disputes would be avoided, and much of the jealousy which now exists between the parties would be removed.

It is perhaps a natural but unfortunate circumstance that employers are seldom found to take the initiative in allowing a rise in wages when the state of the market permits it, as they are in case of a fall, and spontaneously to offer what they must sooner or later be compelled to grant. A more prompt and politic course on their part in this matter would go far to neutralize the hostile actions of trade unions. In cases of great oscillations in prices the share participated either by the employers in the shape of profits, or by the employed in the shape of wages, may be for a time greater or less than their normal distribution would justify. And it is possible that some portions of these extra profits may be unproductively spent or so employed as not to benefit the parties more immediately concerned, and even used in totally alien speculations. Yet, in the main, the working classes must receive, in one way or another, a considerable advantage from them, there being no doubt that the largest portion of such extra profits will be reinvested in the ordinary industries of the country. In the end, however, wages and profits will be divided among the producers in proper proportions, and if at any time profits or wages should be larger than they ought to be, we may be quite sure that ere long the competition of capitalists will tend either to the lowering of prices or to the raising of wages, so as to make profits and wages gravitate toward each other.

Immediately allied to the question of the determination of a minimum of wages is that of their uniformity. In the opinion of many trade unions all workmen of average ability in any trade should earn the same wages, the average ability of each man being understood to have been determined in advance by the fact of his being admitted as a member of the union. But a man is subject to no examination, and is generally admitted upon the testimony of those who have worked with him, whose evidence must frequently be fallacious and insufficient. Nor does it appear that the rejection is absolutely certain even if the applicant should not be deemed a man of average ability, the acceptance or rejection of the party being always optional with the lodge to which he is introduced. Your committee are therefore not satisfied that any guarantees exist that every member of a union is able to earn a fair day's wages for a fair day's work; and they cannot, therefore, agree in the proposition that all workmen should be entitled to uniform wages on the ground of uniform ability. But another reason has been alleged for the uniformity of wages—which is still less tenable than the former, viz., a supposed uniformity of production independent of skill. The right of the workman to a uniform standard of wages was stated to be the production of an article which, though demanding less skill to perform, is of equal utility and is proportionately as profitable to the employer. Your committee must, however, entirely demur to the principle that, in the apportionment of wages, no account should be taken of the skill brought to bear on the execution of the task, since a system of that nature would act as a premium on the inferiority of workmanship. Again, by another test, should the right of each individual to earn certain wages be determined, and that is by his productive capacity. Professor Levi asked whether that was taken into account when the workman was assumed to be of average ability; and the answer was that the amount of production depended largely upon the skill. "The more skillful a man is the more he will produce." But whilst in so far as this answer was correct it contradicted the principle embodied in the preceding test, the answer itself did not take sufficiently into account that skill is not the only element in effectiveness of labor. There are qualities of mind, judgment, and even of heart, disposition, and of moral character, which go far to increase or diminish the efficiency of labor; and of such qualities the employer is, of necessity, a far better judge than any union can be. That under ordinary circumstances wages in any trade should tend to uniformity is quite possible. The faculty of communication and the extension of intercourse of necessity equalize prices and wages; but any attempt to compel uniformity of wages among any large number of men of varied capacity

must of necessity prove a source of disappointment.

Much, again, may be said in favor of a common standard of wages in any industry, as avoiding the embarrassment necessarily encountered in any attempt to adjust the rate to the exact worth of each individual. Yet it is impossible to ignore the fact that, whilst a uniform rate is sure to operate unjustly in favor of persons who may be wanting in fairness of dealing or capacity for workmanship, in the nature of things it is almost incapable to exist over a wide area, having regard to the varieties in the prices of fuel, carriage, house accommodation, or of the means of livelihood, as well as in the cost of raw materials and in the processes employed as effecting the rate of production of each individual. On the whole, your committee find that an absolute uniformity in the rate of wages in any trade, though to a certain extent convenient, is neither just nor practicable, whilst any effort to compel uniformity in the amount of earnings of any number of individuals must prove fallacious and wrong, as an illegitimate interference with the rights of industry.

A still more important question in connection with the subject is how far combination of any kind can effect permanently or temporarily the rate of wages. Upon this, as might be expected, the most divergent opinions are held by the representatives of capital and labor. The employers of labor, standing on the solid principle of political economy, deny that combinations can under any circumstances affect the rates of wages, at least in any permanent manner; the argument adduced being that if workmen are entitled to higher wages they are sure to get them, since, under the law of supply and demand, whenever it is found that profits trench unduly upon wages, fresh capital is sure to be introduced, which provides for the raising of wages. The employed, on the other hand, confidently appeal to past experience, and point to the fact that almost every increase of wages has been due to the action of trade unions. They say that without combination workmen cannot secure the market price of their labor, but are, to a certain extent, at the mercy of their employers; that in trades where one establishment employs a large number of workmen, the employers can discharge a single workman with comparatively slight inconvenience, while the workman loses his whole means of subsistence; that without the machinery of combination the workmen, being dependent upon their daily work for their daily bread, cannot hold on for a market. Your committee are not prepared to deny that combinations can render useful service in matters of wages; but they think that it is impossible for them to frustrate or alter the operations of the laws of supply and demand, and thereby to affect permanently the rates of wages. Combinations may hasten the action of those laws which would undoubtedly, though, perhaps, more slowly, operate their own results. The limited power of combinations is in effect admitted by the workmen themselves. "We do not say," said one of the workmen's representatives, "that trade unions can absolutely interfere with supply and demand, because when trade is very bad they cannot obtain the standard; when it is good they easily raise the standard. What they do is, they enable workmen sooner to strike at the right time for a general advance. They get the advance sooner than if they were an undisciplined mob, having no common understanding. And when trade is receding, the common understanding enables workmen to resist the pressure put upon them by their employers. It helps them in both ways, and the workmen find that they can act together beneficially." The ground here taken by the workmen is not at variance with sound economic principles. But there is yet another way in which trade unions may prove useful, and that is by rendering wages more sensitive to the action of the state of the market, and so preventing the influence of custom to stand in the way of the operations of supply and demand, for there are such occupations—as agriculture—where custom often exercises imperious rule, even upon wages. As it has been well said by M. Batié, "wages do not change unless the causes for the change exercise a strong influence. If the conditions of supply and demand do not undergo a great change, wages continue the same by the simple force of custom. The variations of wages are not like those of a thermometer, where the least clouds are marked, where one can read the smallest changes of temperature. They may rather be compared to those bodies which do not become heated except under the action of an elevated temperature, and remain quite insensible to the slight modifications of the atmosphere. Until a great perturbation takes place in the conditions of supply and demand no one would think of changing the rate of wages." After making every allowance your committee cannot admit that combinations have any power either to raise permanently the rate of wages or to prevent their fall when the conditions of trade require the same, as recent experience abundantly shows, and, whilst admitting that combinations may be beneficial in accelerating the action of economic laws, your committee cannot be blind to the fact that they produce a state of irritation and discontent which often interferes with the progress of production. Limited as is the power of combinations to affect the rate of wages, still more limited is their power to affect materially the progress of productive industry. What is, perhaps, most objectionable in combinations of labor is the method they often pursue in order to operate on the rate of wages; for they are not content with making a collective demand on employers for a rise, but endeavor to force it, or resist a fall by restricting the supply of labor and increasing the need of it. One such method, explained at the conference, seems to your com-

mittee peculiarly objectionable. A representative of labor said, "that when depression of trade comes, by means of associated funds the men are able to say to the surplus laborers, 'Stand on one side; you are not wanted for the time being. If you go on with your labor at half price it will not mend the trade. We will not let you become a drag on the market, putting every other man down, but we will sustain you.'" In three years, your committee were informed, over £100,000 was thus paid for unemployed labor, in the hope that undue fall in wages would be prevented by keeping laborers out of the market. Your committee are of opinion that the artificial prevention of a fall of wages, when such a fall is necessary and inevitable, is economically wrong, and can only have the effect of still more injuring the condition of workmen, since by so doing they only throw hindrances in the way of production, which is the parent of all wages. Equally objectionable, in your committee's opinion, as interfering with the freedom of labor and with the general economy of production, is every regulation of such trade unions that excludes from employment in the trades all who have not been regularly apprenticed, or any rule which should set a limit to the number of apprentices. Professor Cairnes, commenting on the monopoly thus advocated by trade unions, said: "It is monopoly, moreover, founded on no principle either of moral desert or of industrial efficiency, but simply on chance or arbitrary selection, and which, therefore, cannot but exert a demoralizing influence on all who come within its scope—in all its aspects presenting an ungracious contrast to all that is best and most generous in the spirit of modern democracy."

The only other question on which your committee will report is, whether an artificial restriction of labor, or of capital, can, under any circumstances, be economically right or beneficial. It is, indeed, scarcely necessary to say that any restriction of labor or of capital, having the effect of limiting production, must, of necessity, prove injurious. Yet it may be a point for consideration whether, under certain circumstances, it may not be better for either labor or capital to submit to the evil of restriction, in order to avoid a still greater evil of producing at a loss, or working at rates of wages not sufficiently remunerative. The laborers justify their proceedings in this respect by reference to the practice of producers. One of the representatives of labor, speaking on this subject, said: "No doubt there is not a workman in Lancashire who would not say that limitation was an injury. Generally, that there should be the largest possible production in a given time, is no doubt a true law, but every trade must regulate that according to its own necessities. The iron master blows out his furnace when an increased production would injure; the cotton manufacturer runs his machinery short time, and the laborer limits the production." There is little or no difference in the relative position of capital and labor, as respects their need of continuous production. Primarily, both employer and employed alike depend upon production as the only source for profits and wages. Whilst the employers have the maximum interest in producing as much as possible, from the fact that the fixed capital which they cannot withdraw would lie dormant and unproductive while the forge or mill is silent, the employed find it their interest to aid in such production, inasmuch as they depend upon it for their means of subsistence.

The argument of the employed against a proposal for a reduction of wages is expressed in the words: "If you have too much of an article in the market and you cannot sell, I would rather limit the quantity in your hands than aggravate the evil and take less money for it." But by refusing to work when the employer is able or willing to continue producing, or by not submitting himself to accept lower wages when the inevitable law of supply and demand compels the same, the employed only aggravates his own position, whilst he places the employer in a still worse strait, the certain consequence of the withdrawal of labor being to discourage production, to enhance the cost, and to increase the difficulty of foreign competition—injuries alike to the producer and to the whole community.

A frequent source of contention between employers and employed is the mode of paying wages—viz., by time, such as by the day or hour, or by piecework. There appears to be no uniform practice on the subject. While in some branches of industry the rule is to pay wages by piecework, in other branches the rule is to pay by time—the reason probably being that whilst in some branches it is easy to establish a scale of prices at which the work is to be paid for, in other branches such a scale could not easily be framed. In so far as the method of payment can be considered to affect production, it seems to your committee that whilst payment by piecework is likely to promote quantity of production, payment by time is more likely to promote precision of execution. Your committee cannot believe what has often been alleged, that payment by piecework is often offered to conceal any reduction of wages. If honestly acted upon on either side, payment by piecework has, in the opinion of your committee, all the elements of fair justice. But the question in any case is not of sufficient importance to justify a breach of the friendly relation which should exist between capital and labor. When either party has any decided preference for one system, it seems advisable that the other party should accept the same. The economic effects of strikes and lock-outs are well known, and it matters but little which party in the contest in the end may prove successful. In recent years strikes and lock-outs have occurred among coal and iron miners, the building trade, engineers, the cotton trade, ship builders, and most of the trades and indus-

tries of the country, each and all of which have caused serious losses on the community at large. In the opinion of your committee, a well devised system of conciliation is the only proper and legitimate method of solving labor disputes. And your committee cannot too strongly express their sense of the grave responsibility which rests on either employers or employed when, regardless of consequences, they resort to a step so vexatious and destructive as a strike or lock-out.

## Bells.

The superstitions, romance and poetry associated with the history of bells render them a study of much interest. As far back as their use may be traced we find that fancy and imagination have been constantly employed to express the many emotions awakened by their tones. A remarkable antiquity is ascribed to the use of bells. In Egypt, the feast of Oahis, it is said, was proclaimed by the ringing of bells, and in Calro, at the present time, girls are accustomed to wear strings of bells about their ankles, practices similar to which have no doubt existed in that country for a long time. Among the Hebrews bells were used in the time of Aaron, whose vestment was ornamented with small gold bells intermixed with pomegranates. An old writer solemnly avers that even Noah employed such an instrument to call his carpenters to their work on the ark. An old painting also represents King David as playing with a hammer upon a number of bells before him. The authors of these works, however, must have drawn heavily upon their imagination. Bells hung on the necks of horses are also mentioned in the Bible by the prophet Zechariah. The ancient kings of Persia wore bells attached to their royal vestments.

Bells were used by the ancient Greeks in their religious rites, and especially by the priests of Cybele. In time of war, officers, at certain times during the night, went from sentinel to sentinel ringing his bell to which every sentry was obliged to respond. According to the statement of Aeschylus, bells were concealed within the shields of Grecian heroes. A "bellman" also marched before funeral processions; bells were sounded in triumphal processions, and were also attached to the necks of criminals to warn the people to avoid the spectacle of a man going to his execution. At Rome they were in constant use in domestic life, to announce the hours of bathing, business, etc. Ancient shepherds hung bells upon the necks of their flocks, the sound of which, it was supposed, helped them to become fat. The practice of attaching a bell to the leader of a flock is a very old one indeed. Bells have also been discovered among the remains of many extinct tribes, such as the Peruvians. It is thought, however, that the bells that are described in ancient records were probably nothing more than little tinkling pieces of metal with no uniformity of shape.

THE INTRODUCTION OF BELLS INTO CHRISTENDOM is generally ascribed to Paulinus, Bishop of Nola, in Campania; although it is stated by one writer that his part in the matter was simply the suspension of a large brass kettle, by striking which he announced the time of prayers. During the sixth and seventh centuries the use of bells spread throughout Christendom, and about the year 600, Pope Sabinian ordained that the bells should be used to announce the hours of devotion. During this period, also, hand bells were used extensively. The hand bell said to have belonged to St. Patrick, was made previous to the sixth century, and is a four-sided bell made of thin plates of iron, fastened with rivets and brazed. It is still preserved in Belfast.

Church bells were introduced slowly, and those which were first made were of very small size. By the 15th century the art of founding had reached such excellence that bells of large dimensions were cast, as a bell cast in Paris in 1472 weighed 25,000 pounds. The introduction of church towers was probably coeval with that of church bells. The word belfrey, in fact, being a compound of two Saxon words *bel* and *frede*.

The ancient bell founders of England were an itinerant class of people, and frequently of doubtful character. There were certain ones, however, who ranked among the respectable and even the wealthy classes of society. There is in St. Michaels church, Gloucester, a brass to the memory of Wm. Henshawe, a bell founder, and his two wives, on which is the following curious inscription:

"Pray for the Soul of Willm Henshawe Belfounder and late maire of this Towne and alys & agnes his wyfes the which Willm deceased the — day of — in the yer of our Lord God a thousand and cccc — and the said Alys deceased the secunde day of february the year of Lord Mxvix for whose soules of yor charite say a pater noster and a ave"

In a similar manner was the memory held of those who donated bells to parishes, the mention of the deed being sometimes inscribed upon the tomb of the donor. Such a mortuary inscription is the following:

"Here lyeth buried the body of Jerem Ewstes eldest sonne of Robert Ewstes late of this town of Watlington who gave the treble bell that hangs in this steppell. He deceased the fyrst day of May"

Respecting the age of English bells, Mr. W. C. Lukis, in his little work, "Concerning Church Bells," has given some interesting facts. Of 698 bells in Wiltshire, 63 date prior to 1500, 23 belong to the sixteenth century, 273 to the seventeenth, 239 to the eighteenth and 46 to the nineteenth. It is certain, however, that a much greater number of bells dating prior to 1500 would now be found in England had it not been for the frequent revolutions that have agitated England, involving the spoliation of churches and the confiscation and destruction of the ancient bells. The commencement of bell founding as a staple of Birmingham industry seems to have dated from the middle of the last century. Chimes were cast there about 1780, and from this time the manufacture declined until very recently.



## THE BAPTISM OF BELLS

is a curious relic of the past, and forms an important part of their history. The Roman prelates formerly blessed their bells with great solemnity, they also washed and named them, and it was frequently the custom to give sponsors to them. In the year 968 Pope John XIII. christened a bell after himself, calling it John. The custom was also observed for a long time in England, but was gradually abrogated, although certain bell founders have occasionally revived the practice, employing, however, some what irreverently, rum instead of water, and using the interior of the bell as a tankard.

## THE COMPOSITION OF BELL METAL

is a matter concerning which a wide variation of opinions exist. Copper and tin are the ingredients which form the alloy, but the proportion which the two should sustain to each other is the point of difference, each founder having his own rule regarding the matter. Four parts of copper to one of tin is the ratio frequently employed, while many employ a smaller quantity of copper, some even using as little as three parts of copper to one of tin. In the reign of Henry III. of England, the proportion seems to have been two to one—the copper in all cases forming the greater portion of the alloy—while Mr. Layard found Munich bells to yield on analysis ten parts of copper to one of tin. It is believed that an increase in the proportion of tin improves the sound, but renders the alloy more brittle.

Many other metals have been added to the copper and tin, such, for instance, as gold, silver, iron, lead, arsenic and zinc, but experience has shown that these invariably impair the resonant quality of the bell. In the casting of bells, it was once the custom to cast into the melting pot pieces of silver, both as a tribute and to sweeten the tone of the bell. This impression has since been dispelled. Steel has been used alone, however, in the casting of bells and has yielded superior resonant qualities, although the sounds produced by such bells were unable to traverse a great distance. Cast iron bells containing a little tin have produced good tones, but have proved very brittle. Glass has also been used, and, finally, a missionary to Fiji tells us of a wooden bell made of the hollow trunk of a tree, which when struck with a mallet gave out "a sort of stifled roar which could be heard twelve miles off."

The proportion of the ingredients to each other is one of the considerations which determine

## THE QUALITY OF THE BELL.

It also depends upon the shape of the bell, the elevation between the height, diameter and thickness, and upon the absolute quantity of metal used, the difference in volume between the bells of the present day and those of the middle ages being generally attributed to a variation in the latter particular.

The tone of a bell depends for its pitch, of course, upon the number of its vibrations. The number of vibrations which will be produced by the stroke of the clapper varies directly with the square of the thickness, other things being equal, and inversely with the bell's diameter. Consequently, the larger the diameter the deeper the tone, height and thickness remaining the same, and the thinner the metal the deeper the tone, diameter and height remaining unchanged. English bell founders regard the rules which determine the relation between the tone of the bell and its height, diameter, thickness, volume and constitution, as trade secrets. By chipping away the surface of the bell at the "sound bow" or the quarter, which receives the blow of the clapper, the tone of the bell is deepened. By decreasing the diameter of the lower portion the tone is raised. In a number of bells forming a complete octave the diameters would appear in the following proportion: C 1, D 8-9, E 4-5, F 3-4, G 2-3, A 3-5, B 8-15, C 1-2. By attention to considerations such as these, the tone which a bell will give may be determined in advance, and this constitutes one of the essential improvements which have characterized the founding of bells in modern times.

## THE REMARKABLE BELLS OF HISTORY

are very interesting, and much has been written concerning them in poetry and romance. As early as 1300 the "Jacqueline," a bell of 15,000 pounds weight, was cast, an enormous undertaking for those times, and just two centuries later the famous bell of Rouen was cast, its weight being 36,394 pounds; the latter bell was subsequently destroyed and cast into cannon. Far off China has also achieved a reputation, not for the melody, but for the size of its bells. In Peking there are seven great bells, the largest of which weighs 53½ tons, and is 14 feet in height. It is used to sound the watches of the night. In Nankin there is a bell now fallen to the ground which weighs 50,000 pounds. The bells of China, however, are just as remarkable for their hideous tones as for their size, and being struck with wooden hammers instead of iron clappers do not suggest to European minds very poetic impressions.

But no people have indulged to such an extravagant degree their desire for bells as the Russians. Before the revolution there were 1706 large bells in Moscow of which 37 were hung in a single tower. One was so large that it required 24 men to move the clapper in ringing it. The Russians regard the sound of bells as a part of the act of worship, which may account for their intense admiration for bells. It is a little remarkable, however, that no other portion of the Greek church have adopted them. The Russians never tire of ringing their immense bells, and the tones being produced without reference to harmony are very annoying to the ears of other Europeans. On Sunday, especially, the Russian indulges in this kind of enjoyment, and by means thereof is lifted into a state of extreme devotion, while the Englishman is only conscious of a horrid

din which renders it impossible to converse in the streets.

The bell in the St. Ivan's Cathedral weighs 127,836 pounds. The traveler, Dr. Clarke, says "when this bell sounds a deep, hollow murmur vibrates all over Moscow like the fullest tones of a vast organ, or, the rolling of distant thunder." The great bell of Moscow, or Czar Kolokol (emperor of bells) weighs 443,772 pounds. Its cost has been estimated at above \$300,000. It is 21 feet 4 inches in height, and about 22 feet in diameter.

The great bell of St. Paul's, in London, weighs five tons, two hundred-weight. The metal, at its heaviest part, is ten inches in thickness. It is generally struck by a large hammer, which is connected by a wire to a clock work, which draws it up; it then falls by its own weight upon the external surface of the bell. The clapper proper weighs 180 lbs., and is only used to toll on the death of one of the royal family—the Archbishop of Canterbury, the Bishop of London, the Dean of St. Paul's, or the Lord Mayor. The Great Peter, which was placed in York Minster in 1845, contains twice the metal of the St. Paul's bell, weighing ten tons and 15 hundred-weight. It cost £2000. On the Continent, the most remarkable bell, for size, is one hung in Vienna, which weighs 40,000 pounds. There is also one in Erfurt, Germany, which weighs 30,000 pounds, which is said to surpass in tone all the bells of Europe.

## THE LARGEST BELL IN AMERICA

is that suspended in a Roman Catholic Cathedral, of Montreal, and weighs 29,400 lbs. It was cast in 1847. There are but few bells of any note in the United States; the heaviest is one in the New York City Hall, which was cast in Boston, and weighs 28,000 lbs. Its diameter at the mouth is 8 feet, its height 6 feet, and its thickness at the point where the clapper strikes is 6½ or seven inches. The famous "Liberty Bell," which proclaimed the Declaration of Independence on July 4th, 1776, was cast in England in 1752, and placed in the State House of Philadelphia. The bell was cracked by the stroke of the clapper while being tested, and was recast in Philadelphia under the direction of Mr. Isaac Norris. Upon the top is the inscription placed by order of the Continental Congress, from Leviticus 25, 10, "Proclaim Liberty throughout the land unto all the inhabitants thereof." In 1777, upon the surrender of the city to the British it was removed to Lancaster, and upon its return it was used as a State House bell till 1828, and was again broken while ringing in honor of Henry Clay's visit to Philadelphia. It now stands on a pedestal in the hall of the State House of Philadelphia.

A very peculiar bell was made for Pope Clement the seventh by Benevento Cellini; its exterior was chased, sculptured with reptiles and insects, such as grasshoppers, flies, lizards, etc., and was designed to disperse such visitors when their presence was not desired.

A most interesting and prolific branch of the subject is that of

## THE SUPERSTITIONS CONNECTED WITH BELLS.

The vast amount of legend and superstition which is in some way associated with the subject of bells is absolutely astonishing. It is, however, easy to imagine that the tones of the bell, which then was rarely found except in churches and associated with religious influences, might arouse emotions of a supernatural character among the ignorant. At the present time we have become so much accustomed to large bells, from their use in cases of fires, that this impression of wonder connected with the sound of the bell has gradually worn away. Among the most useful functions formerly ascribed to bells is that of dispelling storms and gales. The production of thunder and lightning was generally ascribed to the influence of evil spirits; it was generally supposed that the ringing of the bell would frighten away the causes of the storm. In Wynkyn de Worde's "Golden Legend" this idea is thus expressed: "It is said that the evil sprites that ben in the region of the ayre double moche when they heve the belles ringen when it thondreth, and when grate tempeste and rages of wether happen, to the ende that the fiendes and wycked spyrites should ben abashed and flee, and cease of the moyvyng of tempeste." This custom has not yet entirely vanished, for in the vineyards of France the bells are rung at the approach of storm to break the clouds; and no longer ago than 1852 the Bishop of Malta is said to have ordered the bells rung for an hour to dispel a gale. Eclipses were also ascribed to such demoniacal agencies, and on such occasions the bells were again rung, and always successfully, because the eclipses always disappeared before their influence.

The passing bell was rung when souls were passing from the world, and constituted their protection against the infernal agencies which lay in wait for them. The tolling bell, now rung after a death, is the only relic of this old superstition, and is regarded as a solemn rite.

The curfew bell, which is still rung in many New England towns at 9 o'clock, is a relic of the custom introduced into England by William the Conqueror. It was rung at 8 o'clock, as a signal for the inhabitants to put out their fires (couvre feu) and retire. The meaning is now entirely lost, although in various parts of England and Scotland the 8 o'clock ringing still continues. There were also the *Ave Maria*, or pardon bell, which was a signal for prayers; the vesper bell or call to evening prayer, and the *Sanctus* bell, on the hearing of which every one was expected to prostrate himself. The tocsin bell, which is so often mentioned in references to medieval times, was to announce the approach of the enemy. The bell also enters into one of the old customs connected with the rite of excommunication in the Roman Catholic church. The bell summoned the assemblage, the anathema was read from a book and the

candles were then extinguished, which put out all hope of pardon, and this is the origin of the expression, "bell, book and candle." The vesper bell has been much employed in poetry. Lord Byron has, however, not given his testimony so decidedly in its favor, for he says of the muezzin which proclaims the voice of prayer from the minaret: "On a still evening, when the muezzin has a fine voice, which is frequently the case, the effect is solemn and beautiful beyond all the bells in Christendom."

## THE BOW BELLS

are familiar to the residents of London, and many odd stories are associated with their tones since they "turned again Whittington three Lord Mayor of London." Happy is he that is born within the sound of the Bow bells. The Turks, however, held different views of bells, for they believed that they disturbed the comfort of souls who were supposed to wander through the air, and Greek Christians were forbidden the use of bells after the capture of Constantinople. The Russian Greek Catholics, however, have gone to the very opposite extreme.

The gloomiest bell in England is the Black Tom of Scot Hill. It was, it is said, given in expiation for a murder, and its ringing is called the "Devil's Knell." It is usually tolled on Christmas eve, in order to impart funeral impressions. Among the most curious beliefs which we have here time to refer to is that relating to mysterious subterranean bells which are supposed to be rung underground by invisible powers. In Lancashire, on Christmas eve, the spirits are said to ring their bells from beneath, to commemorate the event. Nottingham spirits also celebrate the festival by the ringing of unseen subterranean bells, which once were visible and rang in the open air from a certain church which has long since disappeared with an earthquake. The fishermen of St. Ouen's, in France, declare that at certain times the invisible bells are heard under the water, and at such times it is recklessness to go to sea. These sounds are said to come from certain church bells, which were once lost off the coast, and on which occasion all hands were lost. So whenever a storm is coming on these bells toll mournfully from their resting place.

## A Heavy Casting.

The Hartford Evening Post of the 16th inst. says:

The Hartford Foundry and Machine Company this afternoon made one of the heaviest castings ever seen in this section, a 30-ton bed plate for an upsetting and punching machine for the Collins Company, the machine being used to punch in picks, etc., the holes for the handles, at a single blow. In view of the interest surrounding so heavy an operation, quite a number of persons gathered to witness it in the foundry building on Commerce street, south of the company's office. The mold, which has been three weeks or more in course of construction, was about 20 by 25 feet, and 10,000 bricks were used in addition to the large beams forming the frame. The estimate for the amount of molten metal to be used was closely made, but to provide against a lack of supply, which would have been fatal to the casting, four tons additional were melted. In a large reservoir at one end of the mold were 17 tons of melted iron, and at either side immense ladles, one holding three and the other four tons, giving a total of 24 tons.

At eleven minutes past two, the three streams were set flowing, and in three minutes and fifty seconds, the mold was full—20 tons, and the surplus flowed in a stream, from an outlet provided for the purpose, into a series of small channels where it formed into the shape of pig iron, and of a convenient form for breaking up. During the operation of casting, the interior of the spacious building was lighted up by a lurid glare, and the spectators shrank back from the fierce heat, which brought the temperature in the vicinity far up into the nineties. A pretty feature was the shower of sparks which flew off from the streams, dazzling white, and exploding not unlike those from a Roman candle. As the mold filled up, the gas poured in white flames from the vent holes, and at intervals smothered reports were heard, as it exploded when pent up. The operation was a perfect success in every particular.

The casting is about 12 by 30 feet in dimension, with an average thickness of nearly five inches in the nature of frame work, 18 inches deep. It will remain in the mold to cool for six days, and will then be uncovered and remain until thoroughly cold, after which it will be taken to the machine shop to be finished. Its cost is about \$3000.

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JULIA F. OLIVER,

EASTON, NOV. 1875.

Administratrix.

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FOR SALE CHEAP. ALFRED FIELD & CO., 93 Chambers and 75 Reade Streets, N. Y.

## FOR SALE.

At Lowest Manufacturers' Rates. GUNS & SHEET ZINC,

Best German and Belgian Brands, By LOUIS WINDMULLER & ROELKEE, 20 Reade Street, N. Y.

## FOR SALE.

Rolling Mill and Bridge Building Machinery, OF NEW ENGLAND IRON COMPANY.

Upright Corlies Engine, 32 in. cylinder, 5 ft. stroke; wheel, 32 tons, 25 ft. diam.

Puddling Train, Merchant Train, 16 in., built by Totten.

Rotary Squeezer, Etc., Etc. Testing Machine.

Roll Cutters. Milling Machines, and all Machinery necessary for Bridge Work. In lots to suit. Apply to

WM. E. COFFIN & CO., 8 Oliver Street, Boston.

## Valuable Furnace Site

FOR SALE OR ON ROYALTY, Possessing ingredients to make Car Wheel Charcoal Pig at \$14.75 per ton. Any head of water power, Forest, Iron Ore 70 per cent., Limestone, Clay, Refractory Stone for construction about together, same property; makes best neutral flange iron.

H. C. WYETH, Baltimore, Md.

## For Sale.

A first-class Hardware Business, located in the thriving city of Bloomington, Ills. Above business has been established for over twenty (20) years, and presents to any one desirous of doing an "A No. 1" retail and jobbing trade a most favorable opportunity. Amount of stock about \$15,000. Will be sold at a sacrifice. Ample reasons given for selling. For further information, address,

GEO. BRADNER, Bloomington, Ills.

## FOR SALE.

An ¼ inch mill train for making Merchant, Band and Hoop Iron. Will be sold cheap.

Apply to W. W. JONES, Near the Lehigh Valley Railroad Depot, Allentown, Pa.

## A BLAST FURNACE FOR SALE at

Napanoch, Ulster Co., State of New York, on the Delaware and Hudson Canal with extra facilities, and a capacity of 20 tons per day Anthracite or 15 tons of Charcoal, together with a splendid water-power, goes with the furnace. The furnace is in good order and could be put in blast in a short time. Will be sold very low on accommodating terms. Charcoal can be had for many years.

Address, H. BANGE, 94 Gold Street, New York City.

## FOR SALE,

at 10¢ a copy. Weekly Spanish Review and Prices Current. The undersigned is also a Translator from and into the English, Spanish, French and German. Latest

Translations made for the governments of Germany and Spain, Pacific Mail S. S. Co., Walter A. Wood, Morris, Wheeler & Co., Todd & Rafferty; John T. Dunlin; Fisk & Hatch; R. W. Wilde; Wilson Sewing Machine Co.; J. Hess & Co.; H. Marquardt; M. Echeverria & Co., and Chas. E. Little, New York; Hocking Valley Mfg. Co.; W. P. Fott, Son & Co., Phila.; Atlantic and Pacific Land Co.; B. E. Flemming, Jersey City; Wilder & Co., Savannah, and the Tanite Co.; Stroudsburg ("Emery Grinders"), to whom he refers.

C. KIRCHHOFF, Metal Reporter of "The Iron Age," Box 3091, New York P. O.







## THE BAPTISM OF BELLS

is a curious relic of the past, and forms an important part of their history. The Roman prelates formerly blessed their bells with great solemnity, they also washed and named them, and it was frequently the custom to give sponsors to them. In the year 968 Pope John XIII. christened a bell after himself, calling it John. The custom was also observed for a long time in England, but was gradually abrogated, although certain bell founders have occasionally revived the practice, employing, however, some what irreverently, rum instead of water, and using the interior of the bell as a tankard.

## THE COMPOSITION OF BELL METAL

is a matter concerning which a wide variation of opinions exist. Copper and tin are the ingredients which form the alloy, but the proportion which the two should sustain to each other is the point of difference, each founder having his own rule regarding the matter. Four parts of copper to one of tin is the ratio frequently employed, while many employ a smaller quantity of copper, some even using as little as three parts of copper to one of tin. In the reign of Henry III., of England, the proportion seems to have been two to one—the copper in all cases forming the greater portion of the alloy—while Mr. Layard found Munich bells to yield on analysis ten parts of copper to one of tin. It is believed that an increase in the proportion of tin improves the sound, but renders the alloy more brittle.

Many other metals have been added to the copper and tin, such, for instance, as gold, silver, iron, lead, arsenic and zinc, but experience has shown that these invariably impair the resonant quality of the bell. In the casting of bells, it was once the custom to cast into the melting pot pieces of silver, both as a tribute and to sweeten the tone of the bell. This impression has since been dispelled. Steel has been used alone, however, in the casting of bells and has yielded superior resonant qualities, although the sounds produced by such bells were unable to traverse a great distance. Cast iron bells containing also a little tin have produced good tones, but have proved very brittle.

Glass has also been used, and, finally, a missionary to Fiji tells us of a wooden bell made of the hollow trunk of a tree, which when struck with a mallet gave out "a sort of stifled roar which could be heard twelve miles off."

The proportion of the ingredients which determine

## THE QUALITY OF THE BELL.

It also depends upon the shape of the bell, the elevation between the height, diameter and thickness, and upon the absolute quantity of metal used, the difference in volume between the bells of the present day and those of the middle ages being generally attributed to a variation in the latter particular.

The tone of a bell depends for its pitch, of course, upon the number of its vibrations. The number of vibrations which will be produced by the stroke of the clapper varies directly with the square of the thickness, other things being equal, and inversely with the bell's diameter. Consequently, the larger the diameter the deeper the tone, height and thickness remaining the same, and the thinner the metal the deeper the tone, diameter and height remaining unchanged. English bell founders regard the rules which determine the relation between the tone of the bell and its height, diameter, thickness, volume and constitution, as trade secrets. By chipping away the surface of the bell at the "sound bow" or the quarter, which receives the blow of the clapper, the tone of the bell is deepened. By decreasing the diameter of the lower portion the tone is raised. In a number of bells forming a complete octave the diameters would appear in the following proportion: C 1, D 8-9, E 4-5, F 3-4, G 2-3, A 3-5, B 8-15, C 1-2. By attention to considerations such as these, the tone which a bell will give may be determined in advance, and this constitutes one of the essential improvements which have characterized the founding of bells in modern times.

## THE REMARKABLE BELLS OF HISTORY

are very interesting, and much has been written concerning them in poetry and romance. As early as 1300 the "Jacqueline," a bell of 15,000 pounds weight, was cast, an enormous undertaking for those times, and just two centuries later the famous bell of Rouen was cast, its weight being 36,394 pounds; the latter bell was subsequently destroyed and cast into cannon. Far off China has also achieved a reputation, not for the melody, but for the size of its bells. In Peking there are seven great bells, the largest of which weighs 53½ tons, and is 14 feet in height. It is used to sound the watches of the night. In Nankin there is a bell now fallen to the ground which weighs 50,000 pounds. The bells of China, however, are just as remarkable for their hideous tones as for their size, and being struck with wooden hammers instead of iron clappers do not suggest to European minds very poetic impressions.

But no people have indulged to such an extravagant degree their desire for bells as the Russians. Before the revolution there were 1706 large bells in Moscow of which 37 were hung in a single tower. One was so large that it required 24 men to move the clapper in ringing it. The Russians regard the sound of bells as a part of the act of worship, which may account for their intense admiration for bells. It is a little remarkable, however, that no other portion of the Greek church have adopted them. The Russians never tire of ringing their immense bells, and the tones being produced without reference to harmony are very annoying to the ears of other Europeans. On Sunday, especially, the Russian indulges in this kind of enjoyment, and by means thereof is lifted into a state of extreme devotion, while the Englishman is only conscious of a horrid

din which renders it impossible to converse in the streets.

The bell in the St. Ivin's Cathedral weighs 127,836 pounds. The traveler, Dr. Clarke, says "when this bell sounds a deep, hollow murmur vibrates all over Moscow like the fullest tones of a vast organ, or, the rolling of distant thunder." The great bell of Moscow, or Czar Kokol (emperor of bells) weighs 443,772 pounds. Its cost has been estimated at above \$300,000. It is 21 feet 4 inches in height, and about 22 feet in diameter.

The great bell of St. Paul's, in London, weighs five tons, two hundred-weight. The metal, at its heaviest part, is ten inches in thickness. It is generally struck by a large hammer, which is connected by a wire to a clock work, which draws it up; it then falls by its own weight upon the external surface of the bell. The clapper proper weighs 180 lbs., and is only used to toll on the death of one of the royal family—the Archbishop of Canterbury, the Bishop of London, the Dean of St. Paul's, or the Lord Mayor. The Great Peter, which was placed in York Minster in 1845, contains twice the metal of the St. Paul's bell, weighing ten tons and 15 hundred-weight. It cost £2000. On the Continent, the most remarkable bell, for size, is one hung in Vienna, which weighs 40,000 pounds. There is also one in Erfurt, Germany, which weighs 30,000 pounds, which is said to surpass in tone all the bells of Europe.

## THE LARGEST BELL IN AMERICA

is that suspended in a Roman Catholic Cathedral, of Montreal, and weighs 29,400 lbs. It was cast in 1847. There are but few bells of any note in the United States; the heaviest is one in the New York City Hall, which was cast in Boston, and weighs 23,000 lbs. Its diameter at the mouth is 8 feet, its height 6 feet, and its thickness at the point where the clapper strikes is 6½ or seven inches. The famous "Liberty Bell," which proclaimed the Declaration of Independence on July 4th, 1776, was cast in England in 1753, and placed in the State House of Philadelphia. The bell was cracked by the stroke of the clapper while being tested, and was recast in Philadelphia under the direction of Mr. Isaac Norris. Upon the top is the inscription placed by order of the Continental Congress, from Leviticus 25, 10, "Proclaim Liberty throughout the land unto all the inhabitants thereof." In 1777, upon the surrender of the city to the British it was removed to Lancaster, and upon its return it was used as a State House bell till 1828, and was again broken while ringing in honor of Henry Clay's visit to Philadelphia. It now stands on a pedestal in the hall of the State House of Philadelphia.

A very peculiar bell was made for Pope Clement the seventh by Benevento Cellini; its exterior was chased, sculptured with reptiles and insects, such as grasshoppers, flies, lizards etc., and was designed to disperse such visitors when their presence was not desired.

A most interesting and prolific branch of the subject is that of

## THE SUPERSTITIONS CONNECTED WITH BELLS.

The vast amount of legend and superstition which is in some way associated with the subject of bells is absolutely astonishing. It is, however, easy to imagine that the tones of the bell, which then was rarely found except in churches and associated with religious influences, might arouse emotions of a supernatural character among the ignorant. At the present time we have become so much accustomed to the sound of the bell from their use in cases of fires, that this impression of wonder connected with the sound of the bell has gradually worn away. Among the most useful functions formerly ascribed to bells is that of dispelling storms and gales. The production of thunder and lightning was generally ascribed to the influence of evil spirits; it was generally supposed that the ringing of the bell would frighten away the causes of the storm. In Wynkin de Worde's "Golden Legend" this idea is thus expressed: "It is said that the evil sprites that ben in the region of the ayre double moche when they heve the belles ringen when it thondreth, and when grate tempeste and rages of wether happen, to the ende that the fiends and wycked spyrites should ben abashed and flee, and cease of the moyvynge of tempeste." This custom has not yet entirely vanished, for in the vineyards of France the bells are rung at the approach of storm to break the clouds; and no longer ago than 1852 the Bishop of Malta is said to have ordered the bells rung for an hour to dispel a gale. Eclipses were also ascribed to such demoniacal agencies, and on such occasions the bells were again rung, and always successfully, because the eclipses always disappeared before their influence.

The passing bell was rung when souls were passing from the world, and constituted their protection against the infernal agencies which lay in wait for them. The tolling bell, now rung after a death, is the only relic of this old superstition, and is regarded as a solemn rite.

The curfew bell, which is still rung in many New England towns at 9 o'clock, is a relic of the custom introduced into England by William the Conqueror. It was rung at 8 o'clock, as a signal for the inhabitants to put out their fires (couvre feu) and retire. The meaning is now entirely lost, although in various parts of England and Scotland the 8 o'clock ringing still continues. There were also the *Aria Maria*, or pardon bell, which was a signal for prayers; the vesper bell or call to evening prayer, and the *Sanctus* bell, on the hearing of which every one was expected to prostrate himself. The tocsin bell, which is so often mentioned in references to medieval times, was to announce the approach of the enemy. The bell also enters into one of the old customs connected with the rite of excommunication in the Roman Catholic church. The bell summoned the assemblage, the anathema was read from a book and the

candles were then extinguished, which put out all hope of pardon, and this is the origin of the expression, "bell, book and candle." The vesper bell has been much employed in poetry. Lord Byron has, however, not given his testimony so decidedly in its favor, for he says of the muezzim which proclaims the voice of prayer from the minaret: "On a still evening, when the muezzim has a fine voice, which is frequently the case, the effect is solemn and beautiful beyond all the bells in Christendom."

## THE BOW BELLS

are familiar to the residents of London, and many old stories are associated with their tones since they "turned again Whittington three Lord Mayor of London." Happy is he that is born within the sound of the Bow bells. The Turks, however, held different views of bells, for they believed that they disturbed the comfort of souls who were supposed to wander through the air, and Greek Christians were forbidden the use of bells after the capture of Constantinople. The Russian Greek Catholics, however, have gone to the very opposite extreme.

The gloomiest bell in England is the Black Tom of Scot Hill. It was, it is said, given in explanation for a murder, and its ringing is called the "Devil's Knell." It is usually tolled on Christmas eve, in order to impart funeral impressions. Among the most curious beliefs which we have here time to refer to is that relating to mysterious subterranean bells which are supposed to be rung underground by invisible powers. In Lancashire, on Christmas eve, the spirits are said to ring their bells from beneath, to commemorate the event. Nottingham spirits also celebrate the festival by the ringing of unseen subterranean bells, which once were visible and rang in the open air from a certain church which has long since disappeared with an earthquake. The fishermen of St. Ouen's, in France, declare that at certain times the invisible bells are heard under the water, and at such times it is recklessness to go to sea. These sounds are said to come from certain church bells, which were once lost off the coast, and on which occasion all hands were lost. So whenever a storm is coming on these bells toll mournfully from their resting place.

## A Heavy Casting.

The Hartford Evening Post of the 16th inst. says:

The Hartford Foundry and Machine Company this afternoon made one of the heaviest castings ever seen in this section, a 30-ton bed plate for an upsetting and punching machine for the Collins Company, the machine being used to punch in picks, etc., the holes for the handles, at a single blow. In view of the interest surrounding so heavy an operation, quite a number of persons gathered to witness it in the foundry building on Commerce street, south of the company's office. The mold, which has been three weeks or more in course of construction, was about 20 by 25 feet, and 10,000 bricks were used in addition to the large beams forming the frame. The estimate for the amount of molten metal to be used was closely made, but to provide against a lack of supply, which would have been fatal to the casting, four tons additional were melted. In a large reservoir at one end of the mold were 17 tons of melted iron, and at either side immense ladles, one holding three and the other four tons, giving a total of 34 tons.

At eleven minutes past two, the three streams were set flowing, and in three minutes and fifty seconds, the mold was full—30 tons, and the surplus flowed in a stream, from an outlet provided for the purpose, into a series of small channels where it formed into the shape of pig iron, and of a convenient form for breaking up. During the operation of casting, the interior of the spacious building was lighted up by a lurid glare, and the spectators shrank back from the fierce heat, which brought the temperature in the vicinity far up into the nineties. A pretty feature was the shower of sparks which flew off from the streams, dazzling white, and exploding not unlike those from a Roman candle. As the mold filled up, the gas poured in white flames from the vent holes, and at intervals smothered reports were heard, as it exploded when pent up. The operation was a perfect success in every particular.

The casting is about 12 by 20 feet in dimension, with an average thickness of nearly five inches in the nature of frame work, 18 inches deep. It will remain in the mold to cool for six days, and will then be uncovered and remain until thoroughly cold, after which it will be taken to the machine shop to be finished. Its cost is about \$3000.

## Special Notices.

## To Let,

A very desirable office at 49 Cliff Street, New York. Possession immediately.

## TO CAPITALISTS.

By virtue of an order of the Orphans' Court, the undersigned will offer at public sale, in Centre Square, in the borough of Easton, Northampton Co., Pa., on

FRIDAY, NOV. 26, 1875,

At 10 o'clock, A. M., a tract of land situate in the said borough, containing about four acres, on which is erected a valuable

## SHEET IRON ROLLING MILL

in full operation, and thoroughly equipped with all the necessary machinery, tools and implements for the manufacture of sheet iron in large quantities, including one large and one small steam engine. The tract has a good wharf on the Lehigh River, and the mill is connected with the lands of the Lehigh and Susquehanna Railroad Co. by siding. There are also upon the premises two large brick buildings suitable for warehouses, a building for annealing and seven frame dwelling houses.

The terms and conditions will be made known at the time and place of sale, by

JULIA F. OLIVER,

EASTON, NOV. 1875. Administratrix.

## Special Notices.

## DISCOUNT LISTS.

Hinges { Stanley Works' list...10¢ to 50¢ each. 75c. and Butts { Union Mfg Co.'s...10¢ to 60¢ " 75c. Bolt, File and Hinge and Butt List.—Contains all the lists and discounts that are used.....Price \$1.00 Dayton & Lamberson, 97 Chambers St., N. Y.

## SPECIAL NOTICE.

I have three patents for Dies, Machinery, and Tools for making Augers and Bits, each running seventeen years: dated as follows: Dec. 19, 1865; January 31, 1866; and July 3, 1866. There is a special claim on each of the Dies. All persons infringing on said patents will be held responsible to the extent of the law. Russell Jennings. DEEP RIVER, CONN., Sept. 7, 1874.

WANTED TO PURCHASE, 100 tons good Second-Hand T Rails, 18 or 20 lbs. per yard. Address, giving particulars, PIPER & THOMPSON, Lapeer, Mich.

TO LET, A Light, Handsome Office. Possession Immediately. HERMANN BOKER & CO., 101 Duane Street, N. Y.

## MANUFACTURERS

desirous of introducing their goods to the British and Continental Markets, are advised to insert advertisements in the newspaper "IRON," published every Saturday, at 99 Cannon Street, London, E. C.

SCALE: First 3 lines, 3/; every additional line, 10d. Price, 6d. per Copy, or 30/ per annum, inclusive of postage to the United States.

## "BEST THING"

In market, 6400 acres timber lands. 40 inexhaustible IRON ORE banks on water and rail in Missouri. Offered till January 1st at \$4.00 per acre. Special Agents, J. O. BROWN & CO., New Windsor, Md.

## Steel Castings.

Solid and Homogeneous. Guaranteed tensile strength, 25 tons to square inch. An invaluable substitute for expensive forgings, or for Cast Iron requiring great strength. Send for circular and price list to

CHESTER STEEL CASTINGS CO., Erlina St., Philadelphia, Pa.

NEW HARDWARE STORE, At Natchez, Miss.

Manufacturers and Jobbers please send price lists, &c. I want the agency for any good paying article. Can give good references, in Natchez, New Orleans and elsewhere. Address, A. L. FERRAULT.

## WANTED TO PURCHASE

A Hardware Business

in a desirable and growing town. Address, giving full particulars, LOCK BOX, NO. 34, Lebanon, Lebanon Co., Pa.

## Briesen's Patent Agency

FOR SECURING INVENTIONS, TRADE MARKS, &c., IN AMERICA AND EUROPE. No. 258 Broadway, New York. A. V. BRIESEN.

## Important to Manufacturers.

BISSELL, WELLES & MILLET, Auctioneers and Commission Merchants, No. 15 Murray St., New York. Solicit from Manufacturers and others consignments of Hardware and Cutlery for our weekly Auction Sales to the Trade, or at private sale for cash, as desired. Our facilities for moving large lines of goods are unsurpassed. Advances made if desired.

## Business Opportunities.

New Capital Procured, Partnerships Arranged, and Commercial, Mining and Banking Corporations Organized, by CLARKE, CHITTY & CLARKE, Board of Trade Offices, New York. P. O. BOX, 4071.

## Merchant Iron or Nails

Wanted in exchange for 300 tons No. 1 Wrought Scrap Iron.

GILCHRIST & GRIFFITH,

Mount Pleasant, Iowa.

## A. PURVES &amp; SON,

Corner South & Penn Streets, Phila., Dealers in

Scrap Iron & Metals, Machinery, Tools, Shafting & Pulleys, Steam Engines, Pumps & Boilers, Copper, Brass, Tin, Rabbit Metals, Foundry Facings. Best Quality Pigot Brass. Cash paid for all kinds of Metals and Tools.

## DROPPED FORGINGS.

The TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of Iron and Steel Drop Forgings in quantities to order at reasonable rates.

HERMANN BOKER & CO., Proprietors, 101 & 103 Duane St., N. Y.

## Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy. A practical man with means is wanted to join a practical man who is already well established. Address CAR WHEEL FOUNDRY, P. O. Box 134, Selma, Alabama.

## Special Notices.

Complete Illustrated Catalogue free.

## Fine Machinists' &amp; Amateur Tools

AND SUPPLIES OF ALL KINDS. Foot Lathes, Foot Power Scroll Saws, Centennial Foot Grindstones, Taps and Dies, LeCompte's Lathe Dogs, Morse Twist Drills, &c. Discounts to Trade. JACKSON & TYLER, No. 16 GERMAN ST., BALTIMORE, MD.

WANTED.—A first-class business man familiar with machinery and manufacturing, capable of handling large bodies of men, desires a responsible position. References satisfactory. Address, IRON AND STEEL, Care of P. O. Box 813, Bridgeport, Conn.

## For Sale.

## FOR SALE CHEAP.

One No. 3½, Ball's Planer and Matcher, not used 6 months. One No. 2½, Wetherby Rugg and Richardson Planer and Matcher, used same time. One No. 3, Ball's Planer and Matcher, used same time. One Daniel's Planer, 30 in. wide, 18 ft. long, almost new. One No. 4 "Fitchburg" Drill, almost new. One Vreeland Iron Planer, planes 60 in. wide, and 19 ft. long, almost new. CHARLES PLACE, 103 Reade St., N. Y.

## HARDWARE BUSINESS

## For Sale.

In the city of Norwich, Conn., an old stand facing two streets. Rents low. Good help and doing a prosperous business. Large back country. The best of reasons given for selling. Address, FULLER & PARISH, Norwich, Conn.

## For Sale, Stove and Tin Business.

Will sell, on good terms, one of the best arranged House Furnishing Stores in Canada West, at St. Thomas. The premises are roomy, the buildings having been arranged especially for this trade, with Tinsmith's workshops and benches complete for 12 men.

## Present Stock about \$6000.

St. Thomas is the head quarters of the Canadian Southern Railway Co. To a practical, energetic man this offers unusual advantages. Business well established and with good connection. Reason for disposal, present proprietors increasing their wholesale and retail Hardware Store next door to the above premises. Address

HORSMAN & HORSMAN, Iron and Hardware Merchants, St. Thomas, Canada West.

## ELEY BROS.,

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C. KIRCHHOFF,

Metal Reporter of "The Iron Age," Box 3091, New York P. O.



# Trade Report.

Office of THE IRON AGE  
TUESDAY EVENING, Nov. 23, 1875.

The past week has been without events of much general interest in the financial markets. The local money market continues substantially as last reported, borrowers on call being accommodated at 3 to 4 per cent. The discount rate on prime mercantile paper is 6 to 8 per cent. General business is, all things considered, as satisfactory as could be expected at this season. The approach of the holidays will quicken many branches of business, but this will not be felt for some weeks to come.

The gold market has been generally dull, and the premium fluctuations have been unimportant, as will appear from the following table, showing the daily range of the premium:

	Highest.	Lowest.
Thursday.....	114 1/2	114 1/2
Friday.....	114 1/2	114 1/2
Saturday.....	114 1/2	114 1/2
Sunday.....	114 1/2	114 1/2
Tuesday.....	114 1/2	114 1/2

The stock market, alternately strong and weak, but without feature of much interest to the general public, closes dull. The principal dealings have been in Lake Shore, Panama, Pacific Mail, Erie, Rock Island and Northwestern. The closing quotations of active shares are given below.

Government bonds are steady, and without feature. Railway mortgages and general investment securities are firm, and in moderate demand. We give below the closing quotations of governments.

The bank statement for the week shows an increase in the surplus reserve of \$29,275, as compared with last week. The loans are down \$1,204,300; the specie is augmented \$1,302,600, reflecting the payments from the Treasury for bonds and interest; the legal tenders are decreased \$967,200, showing the movement westward; the deposits are down \$2,375,500, and the circulation is increased \$304,300. The following is a comparison of the aggregate averages of the past two weeks:

	Nov. 13.	Nov. 20.	Differences.
Loans.....	\$273,901,600	\$272,697,400	Inc., \$1,204,200
Specie.....	14,409,400	15,712,000	Inc., 1,302,600
Legal tenders.....	48,954,500	47,587,300	Dec., 1,367,200
Total reserve.....	63,265,500	63,996,700	Inc., 731,200
Deposits.....	218,507,300	216,131,800	Dec., 2,375,500
Reserve req'd.....	54,636,825	54,636,825	Dec., 500,515
Excess over reserve.....	8,737,075	9,666,350	Inc., 929,275
Circulation.....	18,145,100	18,449,400	Inc., 304,300

The following tables show the foreign trade movements of the week as fully as we have returns at the time of this writing. As we go to press this week on Tuesday night, instead of Wednesday night, as usual, in order that our edition may be distributed without loss of time from the interruption of business at the Post Office on Thursday, we are unable to give the exports exclusive of specie:

	1873.	1874.	1875.
Total for week.....	\$6,236,063	\$7,880,496	\$4,118,735
Prev. reported.....	349,320,858	346,049,514	289,294,622

Since Jan. 1.....\$355,476,921 \$353,430,040 \$294,013,357

Among the imports of general merchandise were articles valued as follows:

	Quant.	Value.
Anvils.....	80	\$756
Antimony.....	17	1,487
Brass goods.....	13	2,417
Bronzes.....	22	4,772
Chains and anchors.....	27	1,909
Cutlery.....	65	19,988
Gas fixtures.....	1	1,034
Guns.....	26	7,804
Hardware.....	22	3,494
Iron, pig, tons.....	500	10,942
Iron, sheet, tons.....	11	1,486
Iron tubes.....	1,680	1,513
Iron, ore, tons.....	1,110	1,019
Iron, other, tons.....	130	4,596
Metal goods.....	142	13,120
Nails.....	13	822
Needles.....	22	8,116
Old metal.....	271	371
Platina.....	1	4,540
Saddlery.....	1	1,280
Steel.....	1,110	12,797
Silverware.....	3	853
Tin, boxes.....	4	20,350
Tin, 1,875 slabs.....	133,721	1,183
Wire.....	13	819
Zinc.....	110,000	6,939

	Exports of Specie.
Total for the week.....	\$70,727
Previously reported.....	11,273,397
Total since January 1, 1875.....	\$11,344,124
Same time in 1874.....	5,512,072
Same time in 1873.....	17,026,770
Same time in 1872.....	5,880,018

Government bonds at the close were quoted as follows:

	Bid.	Asked.
U. S. Currency 6's.....	125	125 1/2
U. S. 6's 1861, reg.....	123 1/2	123 3/4
U. S. 6's 1861, cou.....	123 1/2	123 3/4
U. S. 5-30 1861, reg.....	114 1/2	114 3/4
U. S. 5-30 1861, cou.....	114 1/2	114 3/4
U. S. 5-30 1865, reg.....	115 1/2	115 3/4
U. S. 5-30 1865, cou.....	115 1/2	115 3/4
U. S. 5-30 1867, reg.....	120 1/2	120 3/4
U. S. 5-30 1867, cou.....	120 1/2	120 3/4
U. S. 5-30 1869, reg.....	122 1/2	122 3/4
U. S. 5-30 1869, cou.....	122 1/2	122 3/4
U. S. 10-40 reg.....	116 1/2	116 3/4
U. S. 10-40 cou.....	116 1/2	116 3/4
U. S. 6's 1861, reg.....	116 1/2	116 3/4
U. S. 6's 1861, cou.....	116 1/2	116 3/4

The latest sales and closing quotations were as follows:

	Bid.	Asked.
Atlantic & Pacific Preferred.....	4 1/2	5
American District Telegraph.....	18	19
Chicago & Northwestern.....	39 1/2	39 3/4
Chicago, Rock Island and Pacific.....	105 1/2	105 3/4
Chicago, Bur. & Quincy.....	112 1/2	112 3/4
Col. Chic. & Ind. Cent.....	4 1/2	4 3/4
Clev. Col. & Ind. Cent.....	56	57 1/2
Cleveland and Pittsburgh.....	80 1/2	80 3/4
Chicago & Alton.....	105	105 1/2
Consolidation Coal.....	47	48
Del. Lack. and Western.....	119 1/2	119 3/4
Delaware & Hudson Canal.....	100	100 1/2
Adams Express.....	60	60 1/2
American Express.....	50	50 1/2
Wells, Fargo & Co. Express.....	15 1/2	15 3/4
Harlem.....	133	133 1/2
Hannibal & St. Joseph.....	23 1/2	23 3/4
Illinois Central.....	94 1/2	94 3/4
Kansas Pacific.....	12 1/2	12 3/4

Lake Shore.....	61 1/2	61 3/4
Michigan Central.....	103 1/2	103 3/4
Morris & Essex.....	36 1/2	36 3/4
Milwaukee & St. Paul.....	36 1/2	36 3/4
Mariposa.....	7 1/2	7 3/4
New York Central.....	105 1/2	105 3/4
New Jersey Central.....	105 1/2	105 3/4
Ohio & Mississippi.....	18 1/2	18 3/4
Pacific Mail.....	39 1/2	39 3/4
Panama.....	129	129 1/2
Pittsburgh & Fort Wayne.....	98 1/2	98 3/4
Pacific of Missouri.....	12 1/2	12 3/4
Quicksilver.....	23 1/2	23 3/4
St. Louis, Kan. City North'n.....	5 1/2	5 3/4
St. Louis, Kan. City North'n Pref.....	30	30 1/2
Tol. Washab. & Western.....	5 1/2	5 3/4
Union Pacific.....	72 1/2	72 3/4
Western Union Telegraph (ex d.).....	75 1/2	75 3/4

## GENERAL HARDWARE.

The week under review has been a very quiet one. There are no buyers of importance in the city, and few changes in values have transpired. Some of our city houses are preparing for the annual stock taking, and before our next issue a good deal of this work will be under way.

The Russell & Erwin Mfg. Co. have now a full stock of Perkins' Horse and Mule Shoes, including the new Snow Shoes, to prevent falling. The demand for these goods has been of late so large as to keep the market constantly bare, causing considerable difficulty in filling orders.

Fisher & Norris, Trenton, N. J., have issued a reduced price list for their celebrated "Eagle Anvils," which will be found in their advertisement on page 25. This reduction, we are informed, brings these goods to a point lower than they have been sold during the past thirty years.

Trade in Foreign Hardware continues dull. In England the market for Coal Chills is strong, the recent advance being fully sustained; here the demand is light, and although the tone of the market shows greater firmness than it has exhibited for some time, quotations remain unchanged.

Alfred Field & Co. have issued the following circular:

NEW YORK, Nov. 15, 1875.  
DEAR SIR: We beg to inform you that we are prepared to take importation orders for Sheep Shears of precisely same patterns as Wilkinson's, and of equally good quality and finish, made by Mr. Isaac Greaves, whose reputation for reliable and excellent goods, is not inferior to any manufacturer in Sheffield. These Shears will be numbered same as Wilkinson's, and can therefore be ordered by Wilkinson's numbers.

We offer you Shears, precisely like Wilkinson's, and quality and finish fully up to his standard, at very much lower prices.

We quote for importation orders discount from list heretofore used for Wilkinson's Shears.

Parties sending us importation orders will be privileged to assort up from our stock at importation prices.

Orders for importation should be sent at once.

We strongly recommend you to try these Shears, as they will give good satisfaction.

We also solicit orders for Greaves' Hedge Shears, both for importation and from stock.

Your friends truly,  
ALFRED FIELD & CO.,  
Agents for Isaac Greaves.

## SCREWS.

We have all sizes of Brass and Iron Flat Head Wood Screws, on hand.

Discount on Flat Head Iron, No. 7 and thinner..... 37 1/2 to 15  
Discount on Flat Head Iron, No. 8 and thicker..... 30 1/2 to 5  
Discount on Flat Head Brass, all sizes..... 30 1/2 to 5

There is no change to report regarding the price of Nails, and we continue our quotation of \$3.00 @ \$3.10 net, per keg, for 101. The demand is light. We have received the following circular:

## IMPORTANT NOTICE.

To the Hardware and House Furnishing Goods Trade: After a long and expensive litigation concerning the Knox & Cabell patents for fitting machines, a final decree was granted by the U. S. District Court of New Jersey against the patent.

Under these circumstances an agreement has been made between C. M. Meserole, manager of the patents, and our firm, by which we have accepted a license to manufacture.

We will hereafter manufacture and keep in stock Mrs. Knox's celebrated fitting machine, which is so well and favorably known, that we need only say that the high standard peculiar to our manufacture of these machines will be strictly maintained.

Dated, Newark, N. J., November 18, 1875.  
LOWRELL & TUCKER,  
Newark, N. J.

The Schweitzer Mfg. Co. have added to their line of specialties an assortment of Handles, for which they have issued the following list:

## HANDLES.

Polished Hickory Axle Handles—Per doz.

26 in. 29 in. 30 in. 31 in. 34 in. 36 in.

All White extra.....\$2.25 2.50 2.50 2.75 3.00 3.00

No. 1.....1.50 1.75 1.75 2.00 2.25 2.25

No. 2.....1.50 1.75 1.75 1.75 1.75 1.75

Polished Hickory Broad-Axe Handles.

Right and Left, 26 inch.....per doz., \$3.00

Our Broad-Axe Handles are reversible; any handle answering for Right or Left Hand, saving the necessity of carrying stock of Right and Left Hand.

Polished Hickory Railroad Pick Handles—36 inches.

Extra.....per doz., \$3.25

No. 1.....2.75

No. 2.....2.00

Polished Hickory Drifting Pick Handles—Washoe Pattern.

30 in. 32 in. 34 in. 36 in.

Extra.....per doz., \$3.00 3.00 3.25 3.25

No. 1.....2.25 2.25 2.50 2.50

They have also issued, under date of 1st inst., the following revised discount sheet:

Office of the SCHWEITZER MANUFACTURING CO.,  
57 READE STREET,  
NEW YORK, Nov. 1, 1875.

DEAR SIR: Please attach the inclosed leaf to our Catalogue of 1875, and note the following changes in our Discount Sheet of July 1, 1875:

17, 18, French Coffee Mills.....	20% dis. instead of 15%
18, French Pot Cleaners.....	20% "
19, 20, 21, Excelsior Calipers.....	" 30%
21, 22, 23, Continental Locks.....	" 30%
24, Combination Locks.....	" 30%
25, 26, Brass Pad Locks.....	" 30%
27, Scandinavian Locks.....	40 & 10%
28, Plumbs and Levels.....	5 & 10%
29, 30, Plumbs and Levels.....	60, 10 & 10%
31, 32, Handles.....	" 60 & 10%
33, Iron Planes.....	20 & 10%
34, Iron Planes.....	20 & 10%
35, Brad Set.....	40 & 10%
36, Scratch Brad Awns.....	40%
37, Patent Peg Awns.....	30 & 10%
38, Patent Brad Awns.....	30 & 10%
39, 40, Stocks and Dies.....	5 & 10%
41, 42, Handles.....	10%

Buck Brothers, Milbury, Mass., manufacturers of Plane Irons, Chisels, &c., have in press a new enlarged catalogue of the goods of their manufacture, which will be issued to the trade in January next. The book will be fully illustrated, and nearly double the size of their present one.

The Cowles Hardware Co., Unionville, Conn., desire the attention of the trade to their Patent Self-Setting Mouse Traps, which they illustrate in their advertisement on page 27. These goods are quoted in a regular way at 25 cents per dozen holes, net.

## IRON.

American Pig.—The week since our last has been a dull one, and no transactions of any consequence have been reported in this market. Our quotations still represent the prices for the best brands, and all others sell at a considerable concession. We quote as last week: No. 1 Foundry, \$24; No. 2 Foundry, \$22; Gray Forge, \$20 @ \$21.

Scotch Pig.—The stock here continues small, the arrivals since our last being only 100 tons. Eglington is the only kind on dock, the others being all in yard. The sales during the week have been confined to trifling lots, and quotations are about the same as last week. We quote: Coltness, \$33; Glengarnock, \$32; Garthsherrrie, \$32.50; Eglington, \$29.50 @ \$30.

Rails.—The market continues without change. We quote: American Rail, \$15 @ \$50 at works, and Steel, \$68 @ \$70 at works.

Old Rails.—A sale of 700 tons has been made by a railroad at \$22.50, cash, here. This is less than they usually sold for before the war. Most of our railroads have Old Rails on hand; some of them a great many, which they have been holding for a better market. We quote, \$22.50 @ \$25.

Scrap.—The price has declined since our last. We note the sale of 300 tons here at \$30, and 500 tons, delivered at Providence, at \$32.75. We quote, \$30 @ \$31.

## METALS.

Copper.—There has not been much activity developed in the Copper market since our last, sales being confined to between 300,000 and 400,000 pounds Lake Superior at 23 1/2 c. @ 23 c. Baltimore is quiet at nominally 23 1/2 c.

Much will depend upon the time when navigation in the lake region will close, when possibly some upward movement may be got on foot. Meanwhile the market here retains its firmness, although manufacturers continue to abstain from operations beyond immediate requirements.

We are now fast approaching the close of the year, and during the interval our manufacturers are, as a usual thing, averse to increasing stock; nor are circumstances such as to cause them to deviate from this rule in the present instance. The year has been a remarkably steady one in point of values thus far, and this is precisely what suits our manufacturers most.

The concentration of a large amount of Copper in a few hands has thus wrought no mischief; on the contrary, as these parties evidently did not aim at any very extraordinary advance, but were content to supply the trade and consumers, their action has mainly contributed to regulate and steady values. Early in January some of the large consumers in the brass regions predicted a fall below 20c. during the year, but although production has been ample, and trade not brisk, the timely stepping in of the parties alluded to above has prevented a heavy decline, and our general interests have been the gainers by it.

A severe decline would have benefited the European users of our Copper chiefly, and our home consumers very little. No official telegrams came to hand from London last Saturday, but a private dispatch calls Chili Bars 281. 10, which would show a slight decline. They are situated in Europe pretty much as we are here; everybody seems to have confidence in Copper at present rates, but whoever is necessitated to part with it on an inactive market, can only do so at a slight concession. The visible supply in Europe is ample, but not excessive, being 37,275 tons November 1. No change has been made in the prices of manufactures of Copper, which remain steady as follows: No. Sheathing, 30c.; Bolts and Braziers, 31c.; Nails, 28c. to 30c.; Bronze and Yellow Metal Sheathing, 21c.; Yellow Metal Bolts, 28c.; and ditto Nails, 21c., net cash.

Tin.—A telegram is to hand from Perak (Malacca), according to which hostilities between the British and natives were proceeding. Soon reinforcements will be on the spot, when we shall be better able to judge of the extent and strength of the rebellion. The price of Tin will be greatly ruled by the turn affairs may take in that locality. But even supposing the Malay revolt amounted to nothing, there are other elements operating in favor of the metal. In England, production has been materially curtailed since January 1, owing to the unprofitable nature of this industry. In Australia production received a check partly from a similar

cause, and partly from the prolongation of drought. Capitalists, both in Europe and here, perceiving the low figure to which Tin had declined, and the increased consumption which it stimulated, have been silently at work for some time past and secured some of this metal, out of which the bottom seemed to have dropped. They do not expect to turn round and sell out on the first little margin obtainable, but to hold on to it till later on we shall know where we stand with respect to our future supply.

All this seems reasonable and logical enough, and from all appearances they have more chances in favor of their venture than against it. In the meantime we remain quiet but firm here at the following gold quotations for large lots: Straits, 19 1/2 c. @ 20c.; English refined, 19 1/2 c. @ 19 1/2 c.; English Common, 19 1/2 c. @ 19 1/2 c., and Banca, 24c. A week ago, Straits, at London, had from 284-10 receded to £38, but since then it has recovered to £84, the last cable dispatch. From Singapore we know nothing for a week past, when Tin was high, say, \$24 per picul. Tin Plates are quiet, but firm, as follows, gold, per box, large lots, ordinary brands: Charcoal Bright, \$7.37 1/2 @ \$7.50; ditto Terne, \$6.87 1/2 @ \$7.25; Coke Tin, \$6.50 @ \$6.75, and ditto Terne, \$6.25 @ \$6.37 1/2. England (per cable) is slightly weaker.

Lead.—The lead situation on this side continues to improve, and we are able to announce some further progress in the shape of large purchases to arrive. Thus 400 tons "Richmond" brand sold at 5 1/2 c., gold, and 600 tons Western at 6 1/2 c., currency, here. On the spot, in small lots, we estimate the sales at something like 100 tons at 5 1/2 c. @ 6c., gold, which is the closing figure on a strong market; that is to say, if anybody wanted a large lot, say 300 tons, he would have to pay the outside rate. Available lead is now well controlled, while of lots afloat little offers. The Europeans, on the other hand, who are laboring under circumstances exactly the reverse of those prevailing on this side, have become weak-kneed on the subject of Lead, and reduced the limits on selected again 1/2 c. gold, within the past few days. The manufactures of Lead have not yet been raised from the late basis of 8 1/2 c. and 9 1/2 c., but may be any day.

Spelter and Zinc.—Of foreign Spelter, 25 tons C. G. H. sold at 7 1/2 c. gold, on the spot; nothing done in "futures." We quote foreign 7 1/2 c. @ 7.40c., gold. Domestic, without displaying much liveliness, moves off steadily now at 7.40c. currency, 30 days, or less 1 per cent. for cash. Sheet Zinc retains its firmness and enjoys a tolerably good demand at 25 c. gold.

Antimony.—After a sale of 25 casks at 14c., gold, holders now ask 14 1/2 c. gold.

## COAL.

The Anthracite Coal market still continues moderately active. As no advance of prices have been announced for the month of December, prices will remain the same as during the month of October. The only feature of the Anthracite Coal trade commanding special remark this week is that of overproduction, and the amount of Coal now coming to market is awakening considerable apprehensions for the maintenance of trade prices.

We see it stated that the Lehigh and Wilkes-Barre Coal Company, and the Delaware and Hudson Canal Company, have commenced a shortening of the daily hours of labor, in order to bring their overstocks of Coal within working control, and all the other regions are having resort to some policy to bring down the production to the demand for Coal in the market.

The quantity of Coal sent from the Schuylkill region during the past week was, by rail, 119,162 tons; by canal, 37,062 tons; total, 156,224 tons, against 135,694 tons for the corresponding period of last year. Increase, 20,530 tons. The quantity so far this year is 4,023,228 tons, against 4,358,152 tons for same period last year; decrease, 334,924 tons.

The quantity sent from all the regions for the week was: Anthracite, 583,703 tons; Bituminous, 70,792 tons; total, 654,495 tons, against 505,870 tons Anthracite, and 67,536 tons Bituminous; total, 573,406 tons for the corresponding week of last year. Increase of Anthracite, 77,833 tons; increase of Bituminous, 9256 tons. Total increase, 87,089 tons.

The quantity sent from all the regions so far this year is: Anthracite, 18,018,198 tons; Bituminous, 3,443,187 tons. Total, 21,461,385 tons, against 18,120,373 tons Anthracite,







## NORTH OF ENGLAND IRON TRADE.

In this locality the approaching suspension of Boleckow, Vaughan & Co. is the principal subject of trade and, indeed, general conversation. It should be borne in mind that the company has over 10,000 men in its employment, consequently a population of some 35,000 to 40,000 is most vitally affected by the important question of "to be or not to be." All orders are said to be in the district. The Cleveland iron masters' returns for October are just out. They show that during that month there were 114 furnaces in blast and 45 out. The production of pig during the month was 169,181 tons, or 9254 tons more than in September. The foreign shipments from Middlesbrough are 29,592 tons, or 6339 less than in September, 1874. The coastwise shipments were 21,910 tons, a decrease of 3600 tons upon last year's comparison. Makers' stocks on October 31 were 76,346 tons, or 647 tons more than on the last day of September.

## TRADES OF SHEFFIELD.

In every department of the local and district iron trade quietude rules, and in no single instance is more than the barest possible margin of profit being made. Many of the iron works are apparently pretty well employed, but careful inquiry reveals the fact that the work is being done at prices which cannot yield any profit, and in some cases are calculated to bring about losses, unless the dead charges can be very carefully extinguished by full work. The announcement of Messrs. Boleckow, Vaughan & Co.'s intended disruption of contracts has caused great interest in this district, which has many ties and connections in common with the North of England. Whether some of the larger Sheffield companies and firms will shortly take similar action, or otherwise, is a question under apprehensive discussion among the men, but the balance of opinion is that it will not be done here at present. On the other hand, the iron masters, or, at any rate, some of them, speak in terms of warlike commendation in relation to Messrs. Boleckow & Co.'s notice, and say that others ought to follow their lead in order to bring down wages and coal to a point which would allow of some little profit being made on iron working operations. My own inquiries lead me to the belief that something will be done in the matter in this neighborhood before long, although at the time of writing I am led to conclude that no organization has as yet been perfected. It is, however, quite certain that many concerns in this vicinity might just as well be closed altogether, for any good they are yielding to their proprietors.

In pig iron there have been a fair number of transactions this week, the majority of them having been arranged on terms which are a little more favorable to sellers than those prevalent at the close of last week. Foundry irons are in steady demand, a good local iron of this class being quoted at about 62/6, delivered at the works. Hematite pig irons are maintained steadily at the following rates: Maryport hematite, No. 3, 72/6; No. 4, 72/6; No. 5, mottled and white, 73/6; Bessemer, No. 1, 80/; No. 2, 77/6; No. 3, 75/; all on the usual terms for cash or bill. Millon Bessemer, No. 1, 80/; No. 2, 77/6; No. 3, 75/; ordinary No. 3, 75/; No. 4, 74/; No. 5, 75/; mottled, 80/; and white, 75/ per ton on four months' terms, or 2% off for prompt cash.

British hematite irons are not very largely dealt in just now in this vicinity, hence they are quoted at purely nominal prices. Few of the rail mills in South Yorkshire or Derbyshire are at all well engaged, with, perhaps, a couple of exceptions, which are instances where the mills are being run on a full day shift in order to effect the early completion of contracts which have been in hand for some time past. Even in these altogether exceptional instances the gain of so keeping the machinery in operation cannot be other than limited, as is evinced by the fact that several of the old-established and best equipped houses in the trade—such as John Brown & Co. and Samuel Fox & Co.—conceive that it is best and most prudent to relinquish rail making for the present, excepting, of course, such favors as may from time to time be forwarded to them by old customers at prices which really are remunerative. Every possible method of economizing fuel and labor, whether by cogging down the ingots, or avoiding reheating, falls to bring down the prime cost within suitable limits, so that, under present circumstances, it is clearly wise to abandon the trade.

A few fairly good commissions for tires are being worked out at Sheffield and Rotherham, some of the goods being in best iron and others in Bessemer steel. Iron seems to have the preference of most of the engineers.

At Darul, near Sheffield, the railway wagon works of Messrs. Craven Brothers are steadily employed on wagons and carriages.

In the cast steel departments there is much complaining and great bewailing as to the immediate future. A few houses—under half a dozen—are just moderately kept going by the process of clearing the order files after the arrival of each post, and others are hardly able to make four days' work. There is, it is true, a moderately regular inquiry for best cast steels, but the quantities taken are so small that the demand does not serve to give the men or machinery much active occupation. As in every other department of the local metallurgical industries, the trade has of late woefully fallen off, and cannot to all appearances be revived. Whether or not Bessemer material has so largely supplanted common cast steel as to account for this continued dullness is not very clear, but there is a suspicion of the fact, which is rendering people cautious about investing their capital in the old steel trade. Very little has been done during the week in merchant iron, of which prices are steady. The new works of the South Yorkshire Hoop Iron Company—a private undertaking—were last week put in operation. They are situated at the Ickles, Rotherham, as also are the new railway tire works of Messrs. Owen and Dyson.

At the fourth ordinary general meeting of the Albion Steel and Wire Company, Limited, last week, the directors' report, showing a loss of £13,900 on the year, or £73,000 in four years' trading, was not adopted, nor were two of the directors re-elected. A committee of six shareholders was appointed to "advise" the directors, and authority was given to call up the unpaid £2.10 per share! The net profits of Wheatman & Smith, Limited, for the past year are £12,417, yielding a total dividend of 25 per cent. for the year. At a stormy meeting of the shareholders of the Sheffield Nickel and Silver Plating Company, Limited, held on Tuesday, the profit and loss account for the fifteen months ending August 31st, 1875, showed a loss of £12,728, and it was stated that the actual worth of the assets set down at over £2300, was not as many shillings, whilst the liabilities were over £17,000!

In the coal trade there have been some few changes, consequent upon the incoming of November, but the alterations are, for the most part, in relation to household qualities. Some of the coal owners have increased their prices by sixpence, others by twopenny, and one or two by one shilling per ton. A few collieries are yet suffering from too much water in the workings.

In cutlery or files there is really no noteworthy change to report.

## BIRMINGHAM AND STAFFORDSHIRE.

Arising out of the advances in the prices of fuel, declared by the coal owners, there has recently been a marked firmness in the finished

iron quotations of the Staffordshire and Birmingham producers. Pig iron cold blast is 25 per cent. below last month, 24/10 to 24/15; and cinder pig, £2.15 to £2.2/6. Branded bars are still £10, but some of the commoner qualities have been advanced 7/6 to 10/ per ton, owing to the stiffness of pig iron. A little business is being done in sheets and hoops, but taking the finished iron trade as a whole, there hardly ever was a time when there was a more unsatisfactory state of things current. In the hardware branches a fair business is reported to be doing. Galvanized goods of all classes are selling well, as also are iron and brass bedsteads. There is an abundance of favors for jewelry, ornaments and electro ware. The local mint (Messrs. Heaton's) has just received a great order for bronze coinage. Ammunition is being very largely produced, as also are locks at Wolverhampton and Willenhall. Currycombs are in better request for the states and elsewhere, and the Walsall saddle and bridle branches are better employed. At Dudley and district there is a good inquiry for naval iron work.

## SOUTH WALES.

There is, once again, very little news from the South Wales iron district. A few cargoes were last week dispatched from Cardiff to Oporto, Melbourne, Rio and Stockholm. These shipments, it should be noted, were almost wholly iron rails, the Welsh pig trade being now on an exceedingly limited scale. There is an attempt being made to reduce the iron workers' wages, and but for certain contingencies Blanaian, Ebbw Vale and other large establishments would have acted in a similar manner. At Briton Ferry works Spanish ores are being used. The Conciliation Board is still holding its preliminary sittings, with closed doors, there being, even yet, some difficulty in getting on in an amicable manner.

## THE METAL MARKETS.

were quiet during the week, with the partial exception of tin, which was irregular. On Tuesday 25th to 26th, Urmeneta copper went off at £82.10/; and on Wednesday 50 tons of Chili at £82.5/; On Friday 50 tons Urmeneta sold at £82.10/; a lot of Wallaroo at £91 to £91.10/; Messrs. Von Dadelzen & North say: "Copper—Dull and rather easier; g.o.b. Chili, £82 to £82.10/; The charters for last 14 days October telegraphed as 1900 tons. Wallaroo, nominally £92; Burma, £89.10/; English, quiet, sellers quote £90 for tough, and £90 for manufacturer. Tin, with little doing, is again rather lower. Straits held for £85 on the spot, and £84.10/ sellers for forward delivery; Australian about £82. In Holland, market quiet; Banca, £52/6; Biliton, 50/6. English smelters have reduced their official prices £1, and now quote £88 for ingots, and £89 for bars. Tin Plates—Dull of sale. Lead is lower, and demand slack; £22 to £22.5/ for good English pig; Spanish silver lead, £21.10/; Spelter—Nothing doing here, nominally £16. Quicksilver lower, the importer of Spanish ores to sell at £10 per bottle.

The Mining Journal remarks: Copper.—The price of Chili bars does not vary much, and the rate has been particularly uniform for a considerable time past, the extent of the fluctuation being only about £1 per ton. Our market keeps quiet, and although sellers do not press sales, buyers, on the other hand, limit their dealings to immediate requirements. Speculation has almost entirely ceased, and the market is left to take its own course, and is governed strictly by supply and demand. The charters for the last fortnight in October are 1900 tons. In English some further attempts are being made to revive the old association of smelters, for the purpose of combining together to make prices more remunerative; but this renewed effort will probably share the same fate in a short time as similar arrangements on all previous occasions, and fall to the ground without result, in any benefit to anybody. Trade combinations are generally understood to be bad in principle, and do not work satisfactorily. It is surely far better to be free from all restrictions than to be bound down to certain fixed conditions, which all former experiences prove will certainly hereafter be broken or evaded when it no longer answers to abide by them. Lead.—The market is dull, and as Spanish pig can be obtained more freely at lower prices, the English have reduced their quotations. Quicksilver.—This metal for some time past has occupied a doubtful position, and prices have taken a downward tendency. Holders appear to have no confidence in the future stability of the market, and it would, therefore, be surprising if buyers displayed any eagerness to avail themselves of the present reduced rate. Under these circumstances it is not improbable that the sellers will have to make further concessions to create an improved inquiry, and until then the market must remain dull and drooping. Second-hand parcels have been offering at £11 per bottle, and this price meets with little or no response from the other side; £10 has just been accepted from importers. Tin.—All the week the market has assumed a quiet appearance, and the amount of business transacted has been of a limited character. As the year draws to a close holders generally like to clear off their obligations, and consumers do not wish to increase their stock.

Messrs. Berger Spence & Co. to-day report as under: "Tin.—There is no change to report in the aspect of this metal, its position seeming to be too sound to admit of any manipulation of prices at present current. Copper maintains its position almost unaltered, a slight concession, however, being discernible in favor of purchasers. In Lead the market throughout the week has been devoid of animation, second-hand parcels being obtainable at a shade under market prices. Quicksilver is changing hands at a lower rate than the decline of last week. Several transactions are reported in Spelter, and prices obtained exhibit an improvement."

Messrs. Richardson & Co. (Swansea, Nov. 1st) thus report: "Copper.—Private sales of ores and regulars to the extent of about 2450 tons at 16/ and 17/ per unit respectively, were made on the 1st ult., to arrive, and on the 27th 600 tons ore at 16/9; again on the 29th a cargo of Mexican ore on spot, Liverpool, realized same price. The comparatively light charters advised during the past month have had no very great effect upon the market, and although an improvement took place about the 22d, it has been again lost, and the demand for bars is slack toward the close. The raw material transactions show an improvement of 3d. per unit on those which took place early in the month. The English smelters have put up their prices 20/ all round. The Chili charters for the second half of September were announced as 1500 tons bars and ingots—900 England and 600 France; and the first half of October 1400 tons all bars, 500 being for England, and remainder for France. We quote ores and regulars 16/ 8d. to 17/ 8d. per unit; tough cake, £88 to £90; Chili bars (g.o.b.), £81.15/ to £82.10/."

Messrs. Smith Owen & Co.'s prices current, London, Nov. 6th: "Swedish Charcoal, Iron, &c. (to arrive from Sweden).—Rolled horse nail bars, ordinary sizes, squares and flats, £17.5/; ditto rounds, £17.5/; rolled bar iron, ordinary sizes 15-16 inch to 2 inch squares, 1 7/16 inch to 5 inch wide by 5-16 inch or thicker, flats, £15.15/; hammered bar iron, ordinary sizes 1/2 inch to 2 inch squares, 1 11/16 inch to 5 inch wide by 7-16, 3/4, and 1/2 inch, also 1 1/2 by 3/4 and 1 1/2 by 3/4 inch flats, £16.5/; ditto, superior quality for machine purposes, £16.15/; ditto, short bars, 3 inch by 3/4 inch, 80 to 100 bars per ton, £15; ditto, short bars, 3 inch by 1/2 inch, ditto, £15; ditto, ordinary lengths, 3 inch by 3/4 inch, £15.5/; ditto, ordinary lengths, 3 inch by

1/2 inch, £15.5/; ditto, assortments for India, &c., &c., £15.10/; Keg steel, hammered, £19; ditto, rolled, £18.10/; Steel in cases or bundles, £19; Blooms, £11; Billets, £15.10/; Pig iron, £5.10/; above prices ex-ship, Thames or Hull, less 2 1/2 per cent. discount; ex-ship, Liverpool, 7/6 per ton extra.

There is no quotable change in Liverpool iron or metal prices.

Latest Liverpool prices are:

Iron: f. o. b. in Liverpool, per ton.							
	£	s.	d.	£	s.	d.	
Merchant bar	7	17	6	6	8	5	0
Merchant bar, in Wales	7	7	6	6	7	15	0
Staffordshire	8	10	0	6	11	15	0
Hoop	9	10	0	6	10	15	0
Sheet	11	10	0	6	11	15	0
Nail rod	8	10	0	6	9	0	0
Bar, best crown	8	10	0	6	8	15	0
Boiler plates	11	0	0	6	12	0	0

Tin Plates: f. o. b. in Liverpool, per box.

	£	s.	d.	£	s.	d.
Charcoal, I. C.	1	7	0	1	10	0
Coke, I. C.	1	2	6	1	4	0

Copper: Delivered in Liverpool, per ton.

	£	s.	d.	£	s.	d.
Bolt and Sheathing	97	0	0	0	0	0
Tin	90	0	0	0	0	0
Tough cake	90	0	0	0	0	0
Best selected	92	0	0	0	0	0

	Per cent.
Carbon	0.32
Silica	0.04
Tungsten	0.04
Phosphorus	0.04
Sulphur	0.005

## The Tin Plate Manufacturers of Great Britain.

The following is a list of the firms engaged in the manufacture of tin andterne plates in Great Britain. We print this in reply to several letters lately received, asking for the names and addresses of the principal houses in this trade:

Name of Works. Proprietors. Address.

Abercrombie, Daniel Whitehouse, Abercrombie, Newport, Monmouthshire.  
Aberdulas, Joshua Williams & Co., Neath, Glamorganshire.  
Abergavenny, The Brynmawr Coal and Iron Co., Limited, Abergavenny, Monmouthshire.  
Abertillery, Philip S. Phillips, Abertillery, Newport, Monmouthshire.  
Amman, Amman Iron Co., Swansea, Glamorganshire.  
Avon Vale, Port Talbot Tin Plate Co., Aberavon, Talbach, Glamorganshire.  
Beaufort or Lower Forest, Beaufort Tin Plate Co., Morriston, Swansea, Glamorganshire.  
Bradley, Thompson, Hatton & Co., Bileston, Staffordshire.  
Broadwaters, Thompson, Hatton & Co., Kidderminster, Worcestershire.  
Brookmoor, Budd & Co., Brierley Hill, Staffordshire.  
Burrow, Glamorgan Tin Plate Co., Aberavon, Glamorganshire.  
Burry, Burry Tin Plate Co., Llanelly, Carmarthenshire.  
Cacerion, F. Moggridge & Co., Newport, Monmouthshire.  
Carmarthen, Thomas Lestor & Co., Carmarthen, Carmarthenshire.  
Garth, Garth Iron and Tin Plate Co., Rhydwern, Newport, Monmouthshire.  
Glamorgan, Webb, Shakespeare & Williams, Pontardulais, Llanelly, Carmarthenshire.  
Gower, H. L. Morris & Co., Penclawdd, Glamorganshire.  
Gwendraeth, J. Chivers & Son, Kidwelly, Carmarthenshire.  
Hendy, Edmund Boughton & Co., Limited, Llanelly, Carmarthenshire.  
Hollywell, Hollywell Tin Plate Co., Hollywell, Flintshire.  
Hope, Hope Iron and Tin Plate Co., Tipton, Staffordshire.  
Horseley Fields, Osler Bed Iron Co., Wolverhampton, Staffordshire.  
Horseley Fields or Wilden, E. P. & W. Baldwin, Wolverhampton and Stourport.  
Landore, Landore Tin Plate Co., Swansea, Glamorganshire.  
Llanelly, John S. Tregonning & Son, Llanelly, Carmarthenshire.  
Llangennech, George H. Banks & Co., Llanelly, Carmarthenshire.  
Llantrissant, Llantrissant Tin Plate Co., Llantrissant, Glamorganshire.  
Llwydard, Llwydard Tin Plate Co., Maesteg, Bridgend, Glamorganshire.  
Lydbrook, Richard Thomas & Co., Ross, Herefordshire.  
Lydney, R. Thomas & Co., Lydney, Gloucestershire.  
Machen, Machen Iron and Tin Plate Co., Newport, Monmouthshire.  
Mansel, Mansel Tin Plate Co., Talbach, Glamorganshire.  
Margam, Robert S. Byass & Co., Aberavon, Glamorganshire.  
Marshfield, Marshfield Iron Co. Limited, Llanelly, Carmarthenshire.  
Melyn, Leach, Flower & Co., Neath, Glamorganshire.  
Mold, The Mold Tin Plate Co., Mold, Flintshire.  
Monmouth Forges, David Griffiths & Son, Talbach, Monmouthshire.  
Morlais, Morlais Tin Plate Co., Llangennech, Monmouthshire.  
Morriston, Morriston Tin Plate Co., Swansea, Glamorganshire.  
Parkend, Forest of Dean Iron Co., Lydney, Gloucestershire.  
Pentech and Melin Griffith, T. W. Booker & Co., Limited, Cardiff, Glamorganshire.  
Pontardawe, W. Gilbertson & Co., Swansea, Glamorganshire.  
Pontardulais, Pontardulais Tin Plate Co., Pontardulais, Glamorganshire.  
Pontheor, Conway, Conway & Co., Caerleon, Monmouthshire.  
Ponnewydd, B. Conway & Co., Newport, Monmouthshire.  
Ponnewydd, William Thomas Henley, Pontypool, Monmouthshire.  
Pontyfridun, Conway Brothers, Newport, Monmouthshire.  
Pontymister, Banks & Co., Newport, Monmouthshire.  
Pontypool, Pontypool Iron and Tin Plate Co., Pontypool, Monmouthshire.  
Redbrook, Redbrook Tin Plate Co., Monmouth, Monmouthshire.  
Rugeley, Vacant, Rugeley, Staffordshire.  
Star, Star Iron & Tin Plate Co., Ryder's Green, West Bromwich, Staffordshire.

Stour Vale, Crowther Brothers & Morgan, Kidderminster, Worcestershire.  
The Forest, The Forest Tin Plate Co., Morriston, Swansea, Glamorganshire.

The Old Castle, The Old Castle Iron and Tin Plate Co., Limited, Llanelly, Carmarthenshire.  
Tivdale, Budd & Co., Tipton, Staffordshire.  
Treforest, Treforest Tin Plate Co., Pontypridd, Glamorganshire.

Tydee and Rogerston, John Lewis & Co., Newport, Monmouthshire.  
Tynewydd, Tynewydd Tin Plate Co., Pontnewydd, Monmouthshire.

Upper Forest, Edward Bagot & Co., Swansea, Glamorganshire.  
Vernon, David Morris & Co., Briton Ferry, Glamorganshire.

Worcester, Llanisamlet Tin Plate Co., Middle Forest, Swansea, Glamorganshire.  
Ynyspenllwch, Ynyspenllwch Tin Plate Co., Swansea, Glamorganshire.

Yspitly, Jacob Chivers & Son, Llanelly, Carmarthenshire.  
Ystafers, Ystafers Iron Co., Swansea, Glamorganshire.

## The North Chicago Rolling Mills.

From a description of these works in the Chicago Journal of Commerce, we condense the following: Started in 1857 by that sagacious capitalist, Capt. E. B. Ward, of Detroit, these mills, from a small beginning, have grown to their present mammoth proportions. Their success has been due as much to the comprehensive knowledge of their owners and managers as to the excellency of location, value of machinery and skill of workmanship. The present officers, president, O. W. Potter; treasurer, Capt. S. Clement, and secretary, R. C. Hannah, are ever vigilant in looking after the welfare of the business and perfecting an efficient and harmonious organization. Mr. J. Parks, general superintendent, and Mr. Robert Forsyth, superintendent of the Bessemer department, as well as the superintendents of the various other departments, are efficient men in their various capacities, liberal minded and courteous. The majority of these gentlemen, from the president down, have arisen to their positions of trust through steady application and unswerving perseverance, and need no recommendation to the business public. With regard to the advantageous location of these mills it may be stated that they occupy about 20 acres of ground on the northern outskirts of the city. They are traversed on one side by a branch of the Chicago and Northwestern Railroad, which leads directly into all the other lines radiating from Chicago, while the north branch of the Chicago River flows along the other (or east) side. The Superior iron mines and Illinois and Indiana coal mines are at once commanded by water and rail. The design of the works are such as to combine economy with perfect efficiency. The supply of coal, pig and other material is transported by an excellent system of internal railways. The half dozen buildings are each admirably suited to the special work performed in them. The entire business represents a cash capital of \$3,000,000. Fifteen hundred men are constantly employed to transact it, and 350 tons of coal, 175 tons of Connellsville coke, and 175 tons of ore are consumed daily, producing 175 tons of steel rails, 100 tons iron rails, 100 tons pig iron, and 300 tons Bessemer steel ingots, from which is realized about \$19,000 per day at the present market price of iron. The pay roll of this immense establishment averages \$77,500 per month. The works are comprised of the following principal buildings, all but three fire proof and their machinery:

The Converting House, with dimensions of 150x200 feet. The machinery comprised in this building is 4 cupolas, 6 feet clear diameter and 14 feet high; 1 spiegel cupola; 2 air furnaces for melting spiegel; two 5 ton converters; 11 steel ladles for casting, and the necessary number of ingot molds, flasks, etc. The steam machinery in this building embraces 8 tubular boilers, 5 feet diameter by 15 feet long, having 4 inch tubes with separate grate and chimney; the safety, feed and blow-off valves of each are entirely separate, and repairs can be made on any boiler independently of the rest; 2 blowing engines, made by the Detroit Locomotive Works, for the converters, having steam cylinder 42 inch diameter, air cylinder 54 inch diameter, and 5 foot stroke, each having a 30 ton fly-wheel; each is separate from the other, so that they can be run separately; the moving parts are balanced by an auxiliary piston in a small steam cylinder; 1 duplex pressure pump, Worthington's patent, having 25 inch steam cylinder, 9 inch water cylinder and 20 inch stroke. This furnishes water for operating cranes and hydraulic machinery. Beside a reserved pressure pump, a boiler feed pump and an accumulator with 25 tons of iron inside to counter balance the pressure of the water pumps. The hydraulic machinery in this building consists of cylinders for moving vessels, cranes and lifting apparatus.

The North Steel Rail Mill, with dimensions of 150x200. The machinery in this building is as follows: Two 400 horse-power engines with 24 foot 45 ton fly-wheel; three smaller blast engines; one of the large engines moves the machinery which rolls the rail, the other blooms the steel ingots; 14 rollers, 8 of which are 28 feet long by 16 inch flues—the others are smaller ones; 2 sets of rollers, the one for blooming has a 30 inch 3 high train, that for rolling has a 21 inch 3 high train; there are fitting and feeding tables connected with these rollers; one 5 ton hammer, a swinging saw, with hooks and lifting apparatus and other appliances for chipping, slotting and drilling. This building also contains 11 steel heating furnaces, 8 worked by blast and 3 worked by draft.

The blast furnace building contains 2 immense furnaces, constructed by Mr. Player, each 65 feet high by 17 feet wide in largest part; these furnaces have each 5 tuyeres; 2 splendid engines made by Robinson, Rae & Co. of Pittsburgh, operate the furnaces, each having a 2 air cylinder; there are 12 boilers, 4x60 feet, and much other machinery for moving the ore and molten metal.

The puddling mill contains 2 engines and 7 boilers, 15 puddling furnaces and 3 heaters, together with the necessary implements for handling the pig and slabs. The South Iron Rail Mill is as large a building as the steel rail mill, and containing about the same kind of machinery—for the malleable iron is manipulated very similar to the malleable steel. On the site of this building the first original mill of the corporation was erected. This was burned down in 1860. It now operates 9 furnaces for reheating old and new iron. Beside the above described buildings there are a number of smaller ones, among which are very superior machine shops, offices, etc.

We are informed that the Panama Railroad Co. are about to establish a new line of steamers between this port and San Francisco. Mr. John Roach having put in the lowest bid has agreed to begin the building of seven new first-class steamers at once, the first to be delivered within six months, and the others at intervals of one month thereafter. The price is to be \$425,000 per vessel, one-half in cash, and one-half in bonds. The eighth first-class steamer is to be purchased already built, one suitable in all respects having been offered the company. The four small steamers needed will be selected at leisure, there being plenty for sale. Arrangements have been made for chartering a sufficient number of vessels to carry on the business until the company's new steamers are completed.

An English paper says: Russian engineers are learning to economize. They are not, as heretofore, sending their old rails to this country as such; but they are keeping them at home, and are sending to this country for iron in a partially manufactured state, with which to utilize the old rails in transforming them into new. Blooms are now being made in the Cleveland district, to be used as tops in single, or as tops and bottoms in double headed rails, in connection with the old rails, which will be employed as the center of the new rail. The slabs are cut to lengths suitable for the piles built up of the old rails, and they are being made of a quality of iron of extra hardness. Perhaps 600 tons of these slabs are sufficient, with the requisite old rails, to make 3000 tons of new rails. The economy, therefore, which the Russian engineers are adopting, tells upon the demand for rails for Russia, which was previously expressed by existing companies at the ironworks of this country.

The committee is composed of Messrs. W. Foster Dodge, chairman, J. Smith Hyatt, David M. Meeker, Walter M. Conger, and Phineas Jones. The interest already excited in the question before the committee affords every reason to expect the most thorough and considerate action on their part in the promotion of all proper changes and reforms.

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## Patent Law Reform.

Professor James A. Whitney, President of the New York Society of Practical Engineering, has elaborated a scheme of patent law reform which is meeting with very general approval among manufacturers and inventors. On the evening of the 10th instant he brought it before the Board of Trade of Newark, N. J., and it was well received by that body, as will appear from the following resolutions offered by Mr. W. Foster Dodge, and unanimously adopted:

Resolved, That the thanks of the Newark Board of Trade be, and the same are hereby, extended to Prof. James A. Whitney, president of the New York Society of Practical Engineering, for the interesting and exhaustive address delivered before the Board this evening upon the subject of Patent Law Reform.

Resolved, That the address be referred to a committee of five for their consideration, and to report to this Board such action as may to them be deemed advisable for the Board to adopt in harmony with the address.

Resolved, That the Board of Trade of the city of Newark, N. J., in view of the importance of protecting the inventive talent of the age, commend the subject of a reform in the patent laws to the attention of the various Boards of Trade throughout the United States, and invite their co-operation.

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American Leather Belting.—The British Trade Journal says: "It is certain that the Americans are actively bestirring themselves at the present time, with a view to getting certain of their manufactures into the British market. Their iron and hardware have already got a footing—and in the latter case a by no means despicable one—here; their cotton manufacturers have made the first sign of advance toward a region hitherto dominated by Manchester, and it would seem that the leather trade is now to feel the influence of American competition. It will interest Birmingham and Walsall to know that the first invoice of leather belting has recently been shipped by a New York firm, who, we are told, work up in their Brooklyn manufactory 10,000 hides per annum. The order for the shipment referred to was placed by our great gun manufacturer, Sir William Armstrong, and included two belts of unusual dimensions, one being 2 feet 8 inches wide and 94 feet long, and the other 18 inches wide and 123 feet long, and of double thickness. Leather belting is largely manufactured, as is well known, in the centers of the trade in this country, and as regards material and workmanship could scarcely be surpassed. We can only suppose, therefore, that an English firm was led to place an order for such goods in America by some advantage on the score of price. The American manufacturers deserve all credit for the enterprise and energy they are showing in their endeavors to compete with British makers in their own market. What possible chance could they have of doing so successfully, we ask, if their goods were saddled with such imports as British manufacturers have to bear before they can reach the American consumer?"

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## PHILADELPHIA CORRESPONDENCE.

PHILADELPHIA, Nov. 22, 1876.

There is little to complain of in the way of interesting gossip. The incidents, accidents and occurrences of each day are extremely numerous, and the newspaper man of the present day has an easy task compared to that of his predecessor of thirty years since. Whether the war talk with Spain is what the street vernacular calls "chin," or really serious, cannot be told as yet with any certainty, but of one thing we may be sure, and that is, it will help the shipyards and through them the iron trade. The navy yards are all put into an unusual state of activity, and as ours is being dismantled the work to be done here must go to private yards. The commandant has received orders to hurry up the completion of the new sloops of war lying in the Delaware, and to put a number of monitors in readiness for sea. The following vessels here are ordered into commission, and most of them to sea, viz.: Alert, Alliance, Huron, Ranger, Tallapoosa, Powhatan. The ironclads at League Island nearly ready are Montauk, Manhattan, Saugus, Mahopac, Nantucket, Ajax, Canonicus, Catskill, Jason. Ironclads Passaic, Wyandott, and Nantucket are off to Norfolk to be fitted out. To-day, it is said, quite a fleet of the above will sail for parts unknown, probably "Cuba and a market." The Amphitrite, formerly the Terror, and the Miantonomah, the two biggest fish we have in the ironclad line, are being rebuilt, the first at Chester and the latter at Cramps. These are both double-turreted and will require six months to put them in condition. Roach is said to have laid the keel of a new double-turreted monitor this week at his yard. There is nothing, however, which looks more like business than Commodore Ammen's report to the Secretary of the Navy recommending the immediate construction of steel rams. As you will doubtless publish the report, it is not necessary to quote it here, but if Commodore Ammen is right, the ironclad business will have to be superseded by a ram proof as well as a shot-proof ship. The formidable vessels he proposes are to be 175-200 feet, with 3-foot sponsons adding to their beam. Tapering hull, with curved ends. The vessel to be a combination of the longitudinal and bracket system of framing, composed of 28 girders built up of plates, and angles to break joints. These girders at the bow will be secured directly to the ram. This ram, which is to be the piece of resistance (no pun) of the whole, is, if the system is adopted, going to make the fortune of some steel man. It is to be "a casting of tempered steel, having a solid end, but inside being a hollow cylinder, with radiating flanges cast around it, to which the girders will be riveted." The vessel is to be plated inside and out with iron; to draw 11 feet, but with provision for sinking her in action to a draught of 13 feet, leaving but five feet surface exposed. The pilot house will be a turret of 6-inch steel plate, inclosing also the smoke stack for its protection. The total weight of the ram will be 804 tons; displacement, 1274 tons; and with a velocity of 12 knots an hour, she will have a blow, or impact, of 7920 tons. Now, then, who is to make the rams? Let them be to be a casting of tempered steel; hence, neither Bessemer nor Siemens-Martin can do it, and the crucible men must come to the fore. It will require the organization of a Krupp to effect this with pot steel; but, given the order, the means will not be wanting.

While on iron ships, let me note that, as the Panama Railroad Company proposes a line of steamers of its own, ten in all, to cost \$3,800,000, there is no doubt of their being built on the Delaware, Roach & Sons having offered to build steamers like the Collins for \$425,000 each, and Cramp's bid being \$450,000. This, with the government work ahead, and the steady existing demand, will make lively times on the Delaware next year. All the prospects abroad are of a Continental war, into which England will be dragged, without doubt; our exports are increasing steadily, not only of breadstuffs and provisions, but of cotton goods, leather and hardware, as well as other manufactures. Now, under all these signs ahead, what other result are we to expect but that of unusual, continued and exemplary prosperity to this country, which will afford to the iron trade such a season of legitimate business as we have not even dreamed of. With cost of production reduced to the gold basis of 1860, which is now the case, we are on the verge of the reaction which will insure prosperity.

A very serious damage to the business of this city, although of course temporary in its nature, was caused on Saturday afternoon by the burning of the bridge across the Schuylkill River at Market street. The fire originated during the laying of new gas mains across the bridge, and soon totally destroyed it. The inconvenience to business and travel caused by the loss may be understood when it is considered that nine-tenths of the working traffic between the east and west sides of the Schuylkill, pass over this bridge. The freight cars of the Pennsylvania and Westchester railroads, Adams Express, the various fast freight lines, etc., all use it to reach their depots on Market street, as well as one of the most prosperous horse railway lines of the city. The bridge was a landmark, was known as the old "Permanent Bridge," a title given it at the beginning of the century to distinguish it from the floating bridges at other points on the river. The Permanent Bridge Company was formed in 1798, the corner stone was laid in October 1800, and the bridge finished and opened in 1804. It was altered and repaired in 1849-50 to admit of the passage of the Pennsylvania Railroad tracks. Prompt action is to be taken in restoring it, but it would have been a glorious opportunity for some of the bridge companies—Phoenix, Keystone, Verree or others, to have offered and laid a temporary bridge on the piers between Saturday night and Monday morning.

The Reading Railroad Company's Rolling Mill resumed work on the 15th on full time, and full handed, after stoppage or part time for eighteen months. The usual two weeks at the holidays will be taken for stoppage, after which it is expected the mill will run all the year.

The Illinois, which sailed on Thursday, carries out a trial shipment of fresh meat, consisting of 30 hives and 150 sheep, to be preserved in a refrigerator through which cold, dry air is blown by a five-horse-power, high pressure engine on deck. If it works a large business will be done in this line. The iron steamship Lord Clive arrived this week under charter to the American Line to take the place of the Abbotsford temporarily. She is a big, Clyde-built ship, and brings some Centennial novelties, among others 7715 tiles for the British section of the Centennial Exposition, and the Swedish school-house to be erected on the grounds. The N. & G. Taylor Company head the manifest with 3346 boxes tin and terra plates, 1500 of which are double boxes, and intended for roofing for the Centennial buildings.

Your people have no idea of the rapid in-

crease of our importations of tin plate from Liverpool; 25,000 boxes came in during October, and the November shipment will be still larger. Why is not all this made here? It could be, and should be done. We have the charcoal iron in abundance, and can get the labor. If some of our iron rail mills and bar mills which complain of dull times, would turn their attention to such specialties they would prosper.

The Franklin Institute and the Wagner Free Institute held their monthly meetings during the week. At the former a lot of novelties were shown, viz., a wire stitching machine for book stitching—a new use of wire which should be noted; new roofing and fuel; the Basset electro-motor, &c. At the latter they showed the new decorative material, "Carton Pierre," a chromatic press printing in four colors on a continuous sheet; the Brayton engine, which is a bona fide novelty, &c.

The Inter Ocean has a rival for Keeley in a Mr. Thomas, of the car shops of the Northwestern Railroad, who has a cold vapor machine generated (the vapor, not the machine) from water which does work. Mr. Thomas does not predict miracles in dynamics, but he has done something in the miraculous line it seems.

The Board of Trade held its executive meeting also this week, and among other business transacted received an important report on an amendment of the Bankrupt Law of the country. We are moving in the Industrial Museum, and held a meeting at which real life was shown; committees appointed; the adoption of Memorial Hall for the building secured, and the plan put fairly on its legs. All these signs of activity point to the possibility of what one of the visitors who visited the Centennial remarked, viz., "that no power could keep Philadelphia from being the London of America, while New York must be content to be the Liverpool." But I am running away with my space, and your foreman will take all the leads out of this letter, and after the last sentence he certainly will!

## Some Points in Regard to the Analysis of Water.

Not only the chemist, but the engineer, the physician, the druggist and the plumber are often called upon to express an opinion in regard to the quality of a water. Although the complete quantitative analysis of water is an operation requiring skill, practice, complicate and delicate apparatus and pure chemical reagents, there are a few tests which may be safely undertaken by a person of ordinary intelligence, provided he be careful and patient. We shall begin with one of the simplest and most important of the tests for dangerous metals, namely,

## TESTS FOR LEAD.

1. *Sulphuric Acid.*—This test is so delicate that one part of lead can be detected in 500,000 parts of water. If, then, sulphuric acid be added to water containing one-tenth grain per gallon, a brownish color is produced. If the water has been concentrated by evaporation to 1-100 of its original bulk before adding this reagent, the thousandth part of a grain in a gallon can, with a little practice, be detected. During the evaporation acetic acid must be added to dissolve the oxycarbonate formed. A small quantity of a solution of citrate of ammonia, or of acetate of ammonia, is added to dissolve any sulphate of lead that may have been formed; the latter substance, under the name of *Spiritus Mindereri*, may be obtained at any drug store. It is very difficult to obtain acetate of ammonia in a solid state, requiring to be crystallized under the receiver of an air pump, so deliquescent are the crystals.

Sulphuric acid gas is obtained by the action of dilute acids upon sulphides of iron, sulphide of antimony, or sulphide of potassium (*Hepar sulphuris*). It can also be obtained in an impure state by heating together paraffine and sulphur. The gas should be washed by passing through water, and may then be passed directly into the liquid to be tested, or dissolved in water and bottled for subsequent use.

*Potassic sulphide*, or liver of sulphur, can be employed as a reagent for detecting lead. Its solution produces a dark color in water containing two-thirds grain to the gallon, provided very little of the reagent is added; if more is added, sulphur is precipitated and conceals the lead reaction.

*Ammoniac sulphide* (yellow) produces a change of color, perceptible by comparison when only one-third grain of lead is present in a gallon of water. Both this reagent and the one last mentioned also produce black precipitates in water containing iron, but not in water where tin alone is present. Sulphuric acid, on the contrary, gives a black precipitate with tin, but not with iron. All three of these reagents possess a vile odor, and do not keep well. As soon as the odor becomes faint they are useless.

*Potassic Bichromate.*—This salt possesses several advantages over all the above. It has no odor, can be kept for years either in solution or in crystals, is easily obtained in any drug store under the name of Potassic bichromate. The saturated solution has a deep red color, but when added to a strong solution of lead a beautiful yellow precipitate of chrome yellow is formed. This precipitate, when treated with nitric acid, turns to a bright red, "chrome red." The addition of potassic bichromate to water containing one-tenth grain to the gallon produces a change of color easily detected by comparison. In this, as in the former cases, the test should be made as follows: Two test tubes of equal caliber are taken in the left hand, a few drachms of pure water is placed in one, and an equal volume of the water to be tested in the other. A few drops of the reagent are added to both, and the tubes held in various positions, against white and dark back grounds, against the light and in the shade, viewed vertically and horizontally, until we are convinced that no change has taken place; then a little more of the reagent is added, and so on. These precautions are especially necessary where colored reagents are employed. My own experiments convince me that potassic bichromate is quite as delicate a test for lead as sulphuric acid when these precautions are observed.

*Sulphuric acid* and solutions of the sulphates produce a white precipitate with lead, and according to Lassaigne one part of lead in 25,000 of water can be detected in 15 minutes

by the use of sodic sulphate. As lime also gives a white precipitate with sulphuric acid this test is not applicable to water in general.

*Potassic iodide* produces a yellow precipitate in lead solutions if not too dilute.

When water containing lead is exposed to the air, the carbonic acid of the atmosphere converts the lead into the hydrated oxycarbonate, which is the most insoluble of all the lead salts, so much so that only one part will dissolve in four million parts of water or 1-60 grain per gallon, and hence water which has been exposed to the air a few hours will not contain over 1-4,000,000 of lead in solution. If, however, the water contains free carbonic acid this salt will be dissolved by it, but is precipitated by boiling. From this it will be seen that persons compelled to use water containing lead may reduce the danger to a minimum by boiling, allowing to stand exposed, and then filtering, or even decanting.

## TESTS FOR TIN.

The salts of tin not being poisonous, their detection is of interest only for the purpose of ascertaining whether a given water is attacking the tin pipes through which it passes, for water containing chlorides and nitrites will generally do so.

*Chloride of gold*, which can be obtained of any photographer, will produce a purple color in very dilute solutions of tin salts. A little nitric acid should be added to the gold solution, and if no purple color appears on mixing it with the water to be tested it should be allowed to stand a few days when the purple precipitate will have settled at the lowest point of the test tube, where it is readily seen on placing the tube on a sheet of white paper.

Sulphuric acid yields a precipitate with tin salts, which may be brown or yellow, according to which oxide is present. This precipitate is soluble in alkaline sulphides, and, as above stated, is not formed by ammoniac sulphide.

## TESTS FOR COPPER.

On concentrating a solution of copper and adding ammonia it acquires a deep blue color.

Sulphuric acid and ammonia sulphide both produce a brown precipitate of sulphide of copper. Where lead and copper are both suspected the former is precipitated by sulphuric acid and ammonia added to the filtrate, when an intense blue color will prove the presence of copper.

## TESTS FOR IRON.

The usual tests for iron is ferro cyanide of potassium, known as yellow prussiate of potash, which produces a deep blue color in dilute solution. T. Cornely has even proposed to determine the quantity of iron present by the comparison of the blue colors produced by adding to a solution of ferro-cyanide of potassium in one case, a solution of iron of known strength, and in the other the water in which the iron is to be determined.

A more delicate test is the sulpho-cyanide of potassium, which is said to produce a red color when one part of oxide iron in 64,000 parts of water is present. Dollfus states that salicylic acid produces a violet color with one part of sesqui-oxide of iron in 572,000 parts of water.

## TESTS FOR ZINC.

This metal is the most difficult of all the heavy metals to detect, since iron, which is likely to be present in all water, helps to conceal zinc. It is safe, however, to predicate in advance that zinc is present if the water has been in contact with that metal. Sulphuric acid does not precipitate zinc from acid solutions, unless acetic acid alone is present. Zinc salts give a white precipitate with ammonia sulphide and ferro-cyanide of potassium. To detect zinc in the presence of iron, add enough ammonia to precipitate the iron and to redissolve the zinc which was at first precipitated. Filter and test for zinc in the filtrate by means of ammoniac sulphide or sulphuric acid.

## LIME AND MAGNESIA.

The only ill effect of these substances is to render water hard and unsuitable for washing and for feeding steam boilers. The hardness of water is determined by adding an alcoholic solution of soap and shaking; the quantity of soap required to produce a permanent lather increases with the hardness, and knowing the amount consumed, the hardness is calculated, as fully explained in *The Metal Worker* of Dec. 25, 1874, and in Wanklyn & Chapman's *Water Analysis*. For the benefit of those who have access only to Troy weights and apothecaries' fluid measures, we will add the following simple directions for determining the hardness of water with United States weights and measures. Weigh out 888 grains pure fused chloride of calcium, made by dissolving calx spar in pure hydrochloric acid, and dissolve it in 32 fluid ounces of distilled water. Next, prepare a solution of hard, white soap in strong alcohol, filter and add an equal volume of water. Take 4 fluid drachms of this solution, and place in a bottle with 4 fluid ounces of distilled water. The standard solution of chloride of calcium is added to this from a graduated pipette, until on shaking the frothing stops. If more than 4 drachms of the standard solution of chloride of calcium is required, dilute the soap solution with just enough 40 per cent. alcohol to make 4 drachms of the lime solution neutralize 4 drachms of soap solution in the presence of 4 ounces of water. In determining the hardness of a natural water, measure out 4 ounces of the water and place in a glass stoppered bottle, then add sufficient soap solution to produce on shaking a permanent lather. The number of drachms of soap solution consumed will indicate the number of grains of carbonate of lime (or its equivalent of magnesia), in a United States gallon of 231 cubic inches, allowing 128 fluid ounces, or 1024 drachms to the gallon.

## TEST FOR GASES IN WATER.

Some natural waters contain sulphuric acid, which is easily detected by smell and by its action on bright silver (not nickel) coin, or on paper dipped in acetate of lead solution.

Carbonic acid may be present either in a free state or combined with lime and magnesia, forming bicarbonates. In either case it is expelled by boiling. To ascertain whether any of the carbonic acid is in a free state a strip of turmeric paper is employed, together with a freshly prepared solution of clear lime water. If the addition of a single drop of lime water to the water to be tested causes it to turn the turmeric paper brown, no free carbonic acid is present. If it is necessary to add several drops of lime water before this action takes place the quantity of free acid is quite large. Dr. Von Pettenkofer also employs for this purpose rosolic acid. Free carbonic acid is seldom if ever present in the waters of limestone regions.

## SEWAGE IN WATER.

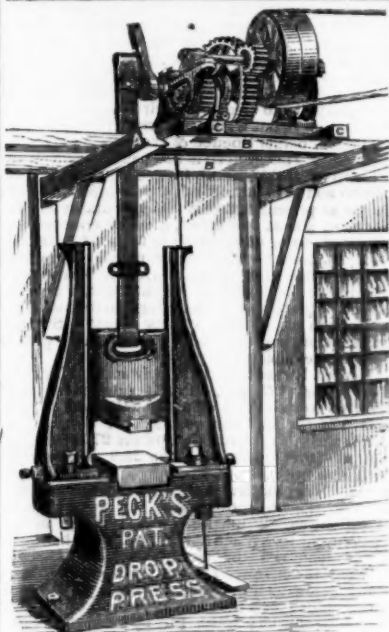
This is a most important impurity, and one which cannot be proved with certainty except by an expert. Where it was suspected that a given well was polluted by a certain sewer the fact was proven by throwing some lithia into the sewer and examining the residue of the evaporated well water with the spectroscopic. Dr. Von Pettenkofer considers the presence of free carbonic acid in water as a bad indication, for this gas, he says, has generally been produced by the decay of organic matter beneath the soil. The presence of carbonate of ammonia is almost sufficient to condemn any water, since this substance is the natural result of the decomposition of urea. Chlorides, nitrites and nitrates as well as phosphates are all suspicious impurities, being frequently found in very bad company. Ammonia is tested for by mercuric chloride, or Nessler's test; nitrites by acidifying and adding starch and iodide of cadmium; nitrates by acidifying with a few drops of dilute sulphuric acid, immersing in it for a minute a rod of zinc or cadmium, and then adding starch and iodide of cadmium; phosphates are detected with most certainty by a few drops of a concentrated solution of acetate of uranium.

## DISSOLVED OXYGEN.

The sanitary condition of water employed for domestic purposes is, says M. Gerardin, intimately related to the presence or absence of dissolved oxygen, and the proportion of this gas present and dissolved determines the hygienic state of the water. Unfortunately, the quantitative determination of dissolved oxygen is very difficult. The French chemist, just mentioned, employs for this purpose the recently discovered hydrosulphite of soda; Prof. Wurtz employs a solution of pyrogalline acidified with hydrochloric acid. Gerardin has discovered that when water retains a normal proportion of dissolved oxygen, the lives of fish and green plants are preserved. As the oxygen diminishes, those animals which have the most active respiration first disappear, and subsequently those of lower respiratory powers, and he concludes that organic matters in a state of decomposition deprive water of its dissolved oxygen, and consequently render it impossible for either plants or animals of superior organization to live in it.

In conclusion we cannot forbear to refer to the important service rendered by the microscope in the analysis of water.

The Portland Boiler Works, San Francisco, Messrs. Moynihan & Aitken, proprietors, are reported busy. From this establishment, some three months ago, emanated the largest marine boiler ever produced on the Pacific coast. It was built for the steamship Senator, and weighed upward of 100,000 pounds. Mr. Moynihan is now engaged in superintending the work being performed on the City of Peking, which consists of strengthening the vessel, the addition of iron decks, box stringers, etc. One hundred and fifty-four men find employment in this occupation. A late undertaking at this establishment was the manufacture of a large boiler for the naval dry dock at Mare Island.



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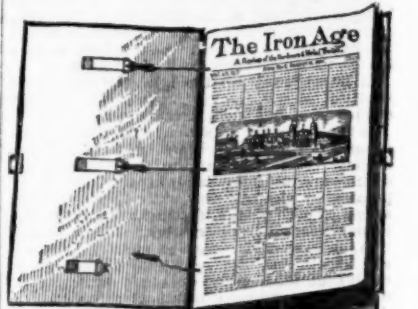
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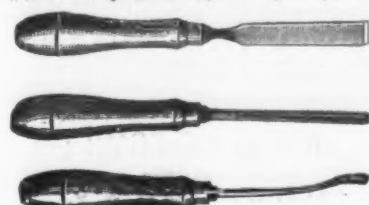
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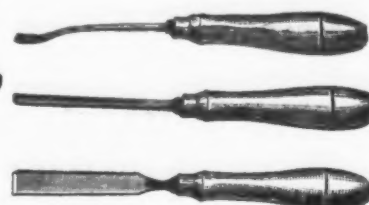
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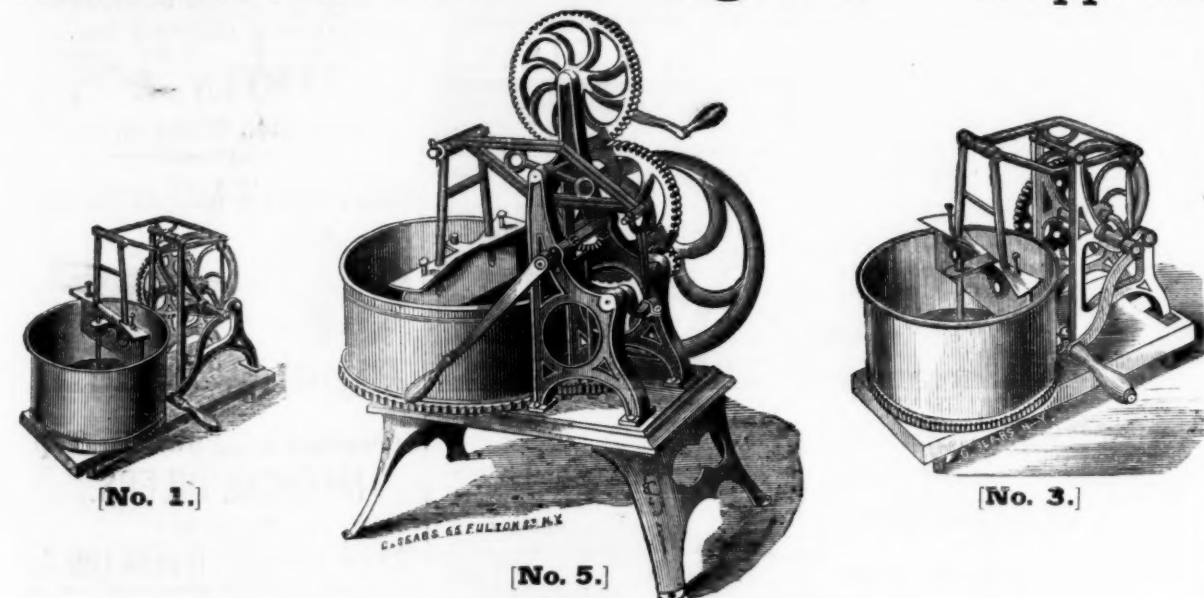


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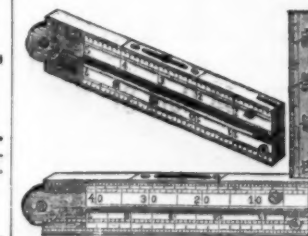
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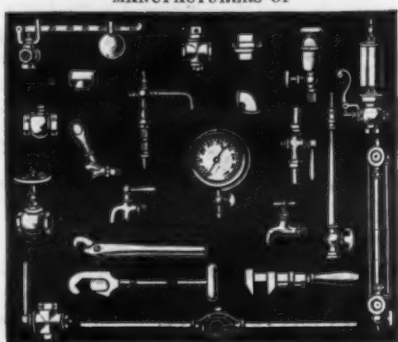


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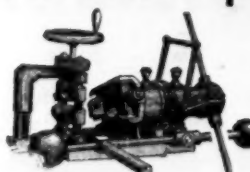
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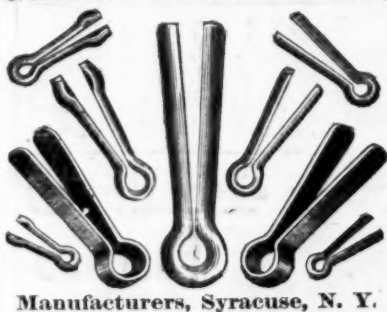
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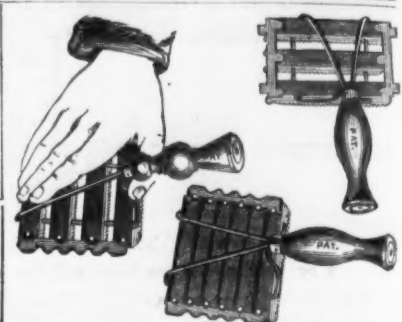
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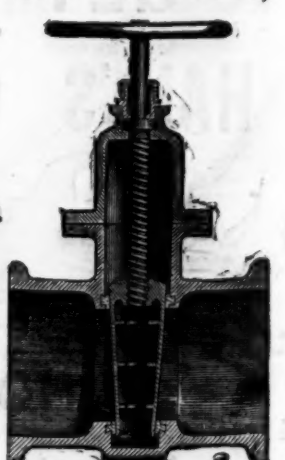
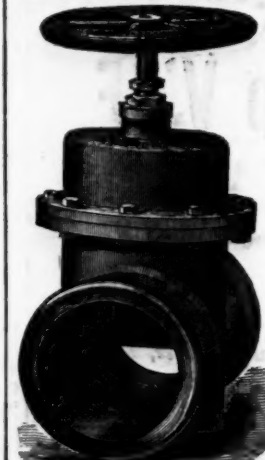
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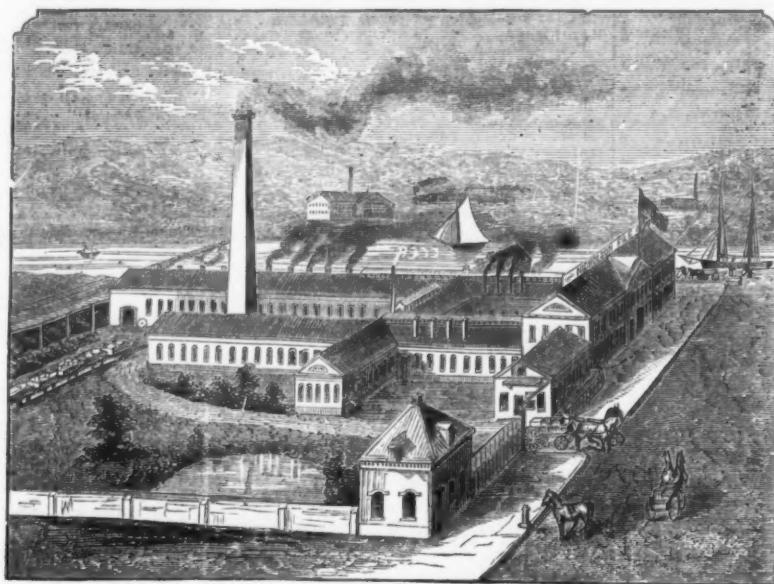
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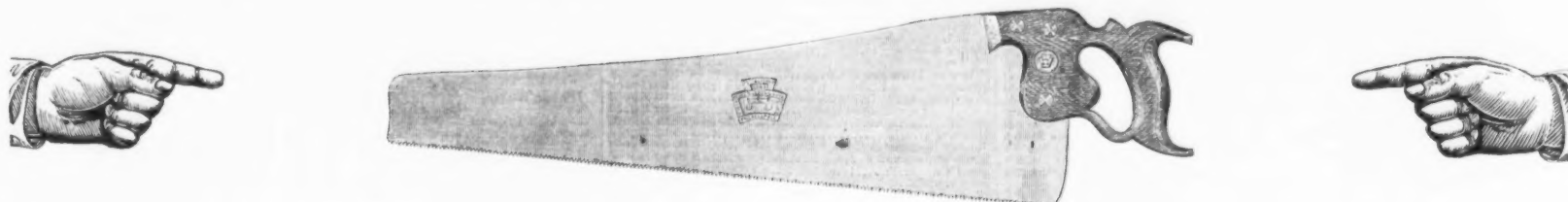
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Front and Laurel Streets, Philadelphia.

## Henry Disston & Sons New Patent Skew Back Hand Saw "CENTENNIAL No. 7."



TO THE HARDWARE TRADE.

GENTLEMEN: We are prepared to supply the trade with an entirely new Hand Saw, called the "Centennial No. 7." This Saw is ground on the back, to taper gradually from butt to point, being only 26 gauge at the point. By this mode of grinding, the Saw, when tested, makes a complete "whip bend." The handle is apple-wood, oil finish, the screws are flush and polished, and the Saw is superior to any ever offered to the trade in this or any other country at the price. It is the sweetest-cutting, nicest-hanging Saw that can possibly be manufactured, feeling as light as a feather at the point, owing to its peculiar construction. The screws are finished before being put into the handle, and, should they become loose, can be readily tightened with an ordinary screw-driver, and still make a good finish. It was our intention to keep this Saw from the market until Centennial year; but second thought has decided us to give the trade an opportunity to test it before then, that they may know whether they can put it in stock without risk. The price of this Saw at present will be the same as that of the regular No. 7. It is a "hard times" Saw, and we do not know how long the price can be sustained. Mr. Henry Disston is willing to risk his reputation as a Saw-Maker upon "the Centennial No. 7." Send for samples and put them in the hands of the Carpenters—to be returned if not as represented.

November, 1875.

### GAUGE SAWS, "HAND AND BACK."



The accompanying engraving represents our Patent Gauge Saw, which is an invaluable improvement where a fixed and definite depth of cut is required. For Tenoning, Souldering, Dovetailing, Curving, Cog-Cutting, etc., it is just the tool. We manufacture them in both Hand and Back-Saws. Remove the gauge from the Hand-Saw and it can be used for any of the purposes to which a Hand-Saw is adapted.

### DOUBLE HANDLE FRAMING SAW.



The advantages of a Framing Saw with a handle at each end are numerous. It can be used by either one or two men. It is particularly adapted for framing. The handles are so constructed that both hands can be used at either end. The thrust is on a line with the cut, and the back of the blade is peculiarly formed. The combination of these principles makes this a very light and easy running Saw.

### STANDARD WIRE GAUGE.

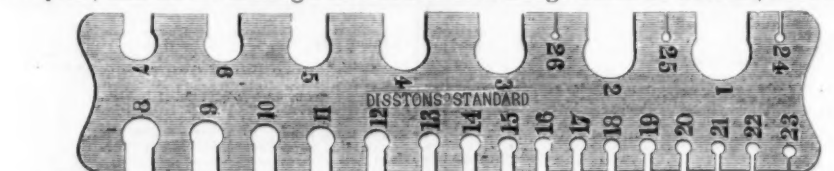
Perfection Attained. Accuracy Guaranteed.

For the past forty years we have had constant trouble with various kinds of so-called Standard Gauges, and have failed to find one in every ten which could be relied on for accuracy. We have repeatedly sent special orders to both English and American makers, but have failed to obtain them true to the required standard.

To insure perfect accuracy, it is absolutely requisite that our gauge and that of our customers should be alike, and to this end we have been compelled to enter the field in this delicate branch of manufacture. Our success is complete, and we are making a correct Standard Gauge which we warrant, and sell at a lower price than the English.

We make them to order in different series of high or low numbers, as the various branches of industry may require. For instance, when the articles to be gauged range between Nos. 0 to 10, the purchaser need not be put to the expense of a gauge running up to No. 36, when most of the numbers will be of no use to him.

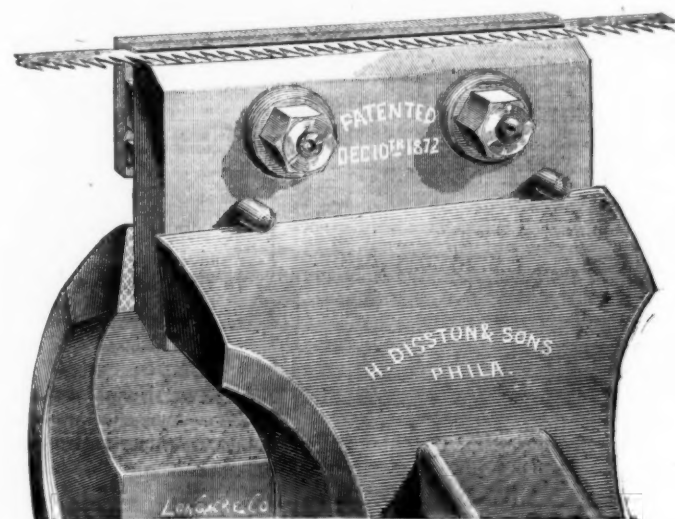
Where one or more numbers are being constantly used, they wear away faster in proportion, in which event we recommend that duplicate incisions of each of the most used numbers be made in each gauge.



Price for Small Gauges, Nos. 1 to 26, - - - - - \$1.75.



Price of Large Gauges, Nos. 0 to 36, - - - - - \$2.50.  
Special Gauges, Special Prices.



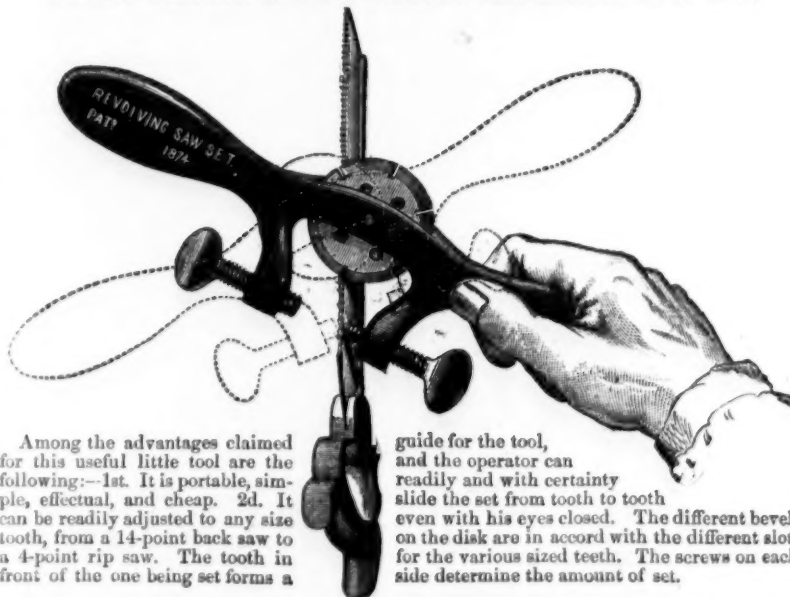
### HENRY DISSTON & SONS' Patent Setting Stake

For Setting Web, Jig, Band or any kind of Narrow Saws.

The principal difficulty experienced in setting a narrow Saw arises from the fact that the blade is liable to tilt or slide backward as each successive tooth is struck by the hammer. The back guide with its projecting lip, under which the Saw passes and is securely held during the process, effectually prevents these difficulties and holds the Saw up to its work; thus the operator is enabled to strike the tooth with certainty every time, and prevents any distorting of the saw blade.

The guide can be adjusted to various widths, by inserting or removing packing, as occasion may require. Either edge of the set can be used by reversing the back guide, and as the edges are of different sizes, they are adapted to Saws of different widths. A narrow Saw set by the aid of this Stake remains as straight after as before; a result which cannot be attained by any other means.

### HENRY DISSTON & SONS' PATENT REVOLVING SAW SET.



Among the advantages claimed for this useful little tool are the following:—1st. It is portable, simple, effectual, and cheap. 2d. It can be readily adjusted to any size tooth, from a 14-point back saw to a 4-point rip saw. The tooth in front of the one being set forms a

guide for the tool, and the operator can readily and with certainty slide the set from tooth to tooth even with his eyes closed. The different bevels on the disk are in accord with the different slots for the various sized teeth. The screws on each side determine the amount of set.

No. 1, large size, - 75 cents.  
" 2, small " - 50 "

HENRY DISSTON & SONS, Front and Laurel Sts., Philadelphia.



[illegible]







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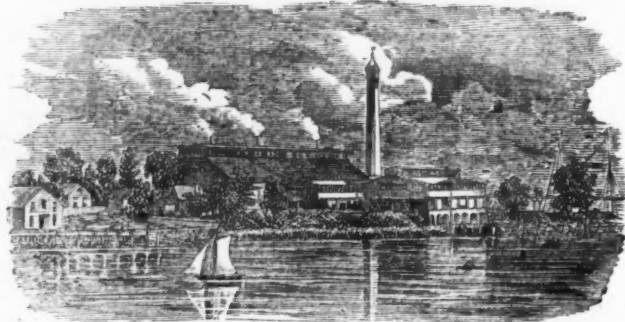
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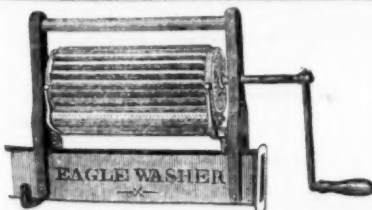
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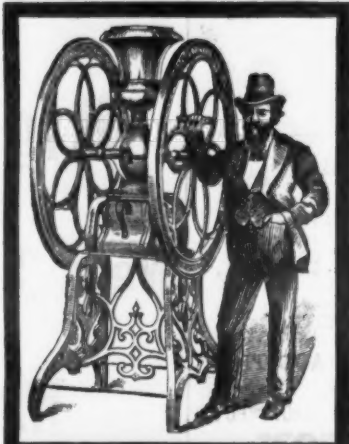
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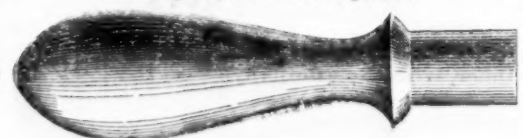
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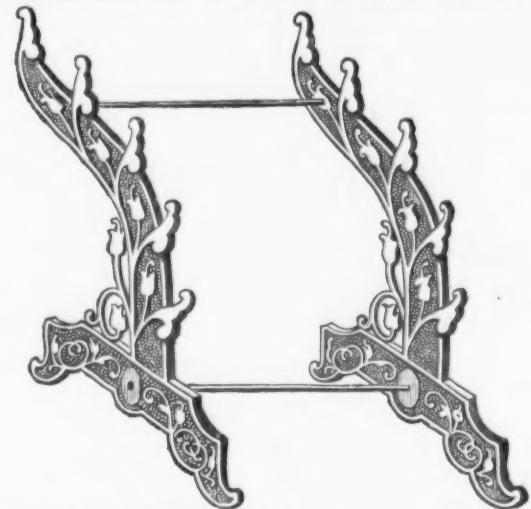
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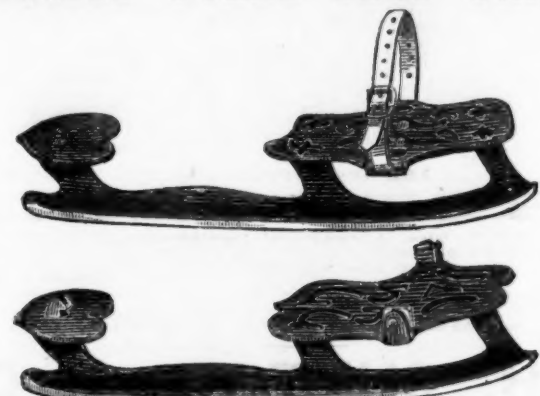
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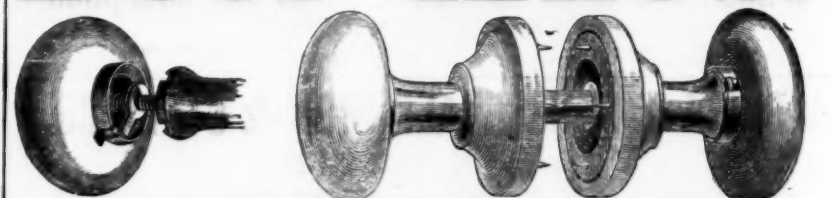
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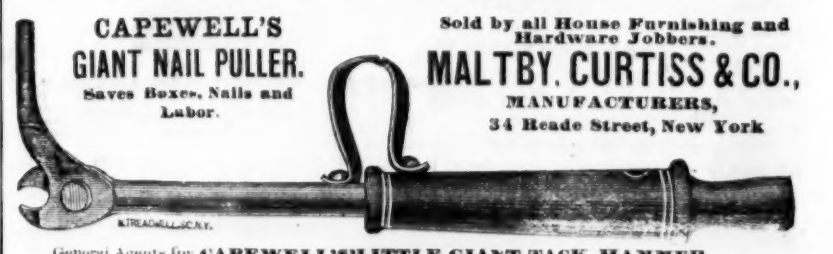
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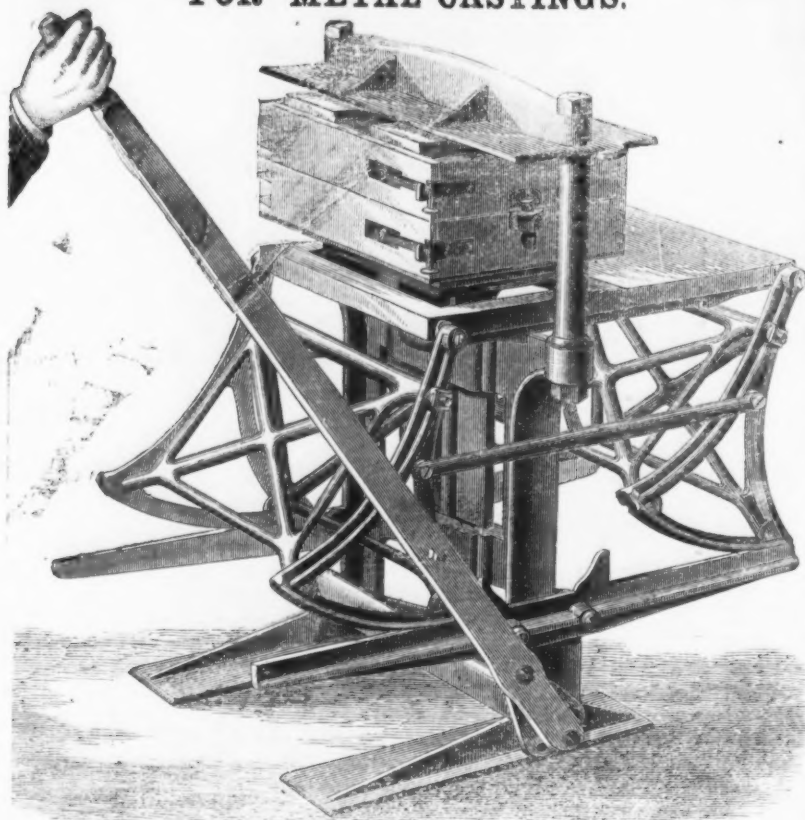
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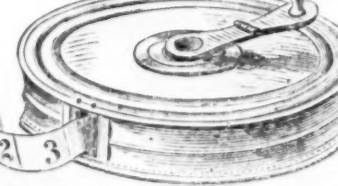
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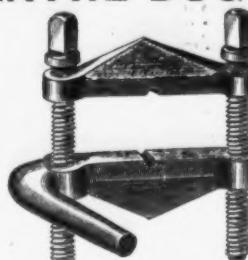
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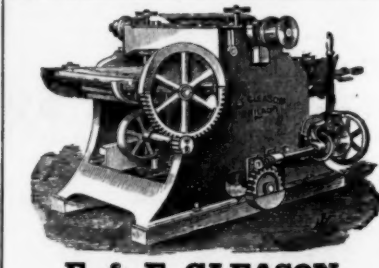
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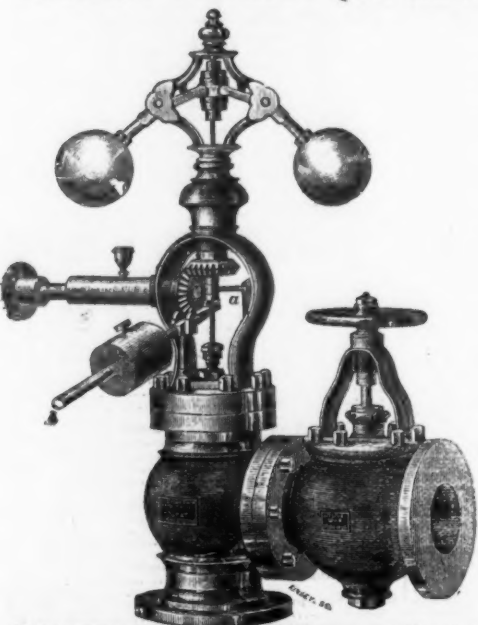
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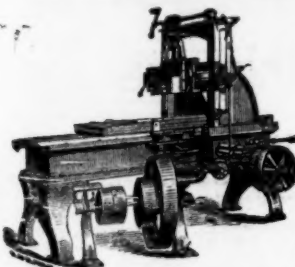
Capacity of Valve or Port in inches.	Price, Black.	Price, Bright Finish.	Price, Portable.	Price of Lever Attachment for altering speed.	Price of Stop Valve.
1/8	18 00	20 00	17 00	..	..
1/4	20 00	22 00	19 00	..	..
3/8	24 00	27 00	22 00	2 00	5 25
1/2	29 00	32 00	27 00	2 25	6 50
3/4	34 00	37 00	31 00	2 50	8 50
1	41 00	46 00	38 00	3 75	11 50
1 1/4	47 00	54 00	..	3 25	16 00
1 1/2	50 00	57 00	47 00	3 50	17 00
1 3/4	55 00	62 00	..	3 75	19 00
2	62 00	70 00	..	4 25	22 00
2 1/4	71 00	80 00	..	4 50	27 00
2 1/2	81 00	92 00	..	5 00	32 00
2 3/4	91 00	103 00	..	5 50	37 00
3	102 00	114 00	..	6 00	42 00
3 1/4	116 00	129 00	..	6 50	48 00
3 1/2	134 00	148 00	..	7 00	55 00
3 3/4	160 00	176 00	..	8 00	69 00
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4 1/2	230 00	255 00	..	10 00	..

No Charge for Box and Carriage.

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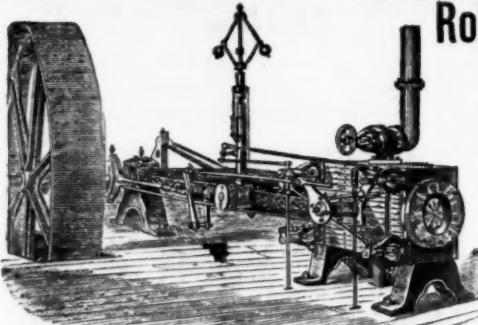
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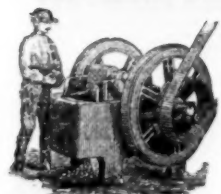
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PORTABLE DRILLS. Driven by power in any direction, self-feed and convenient adjustment.  
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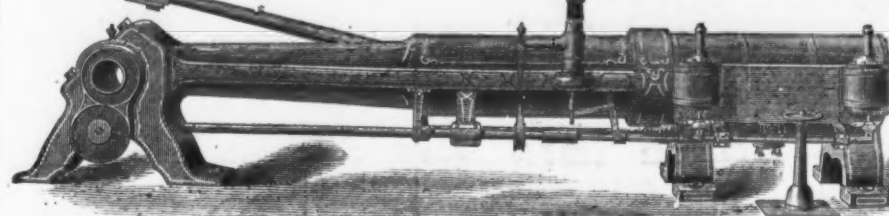
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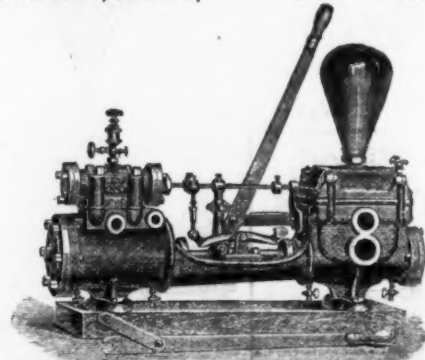
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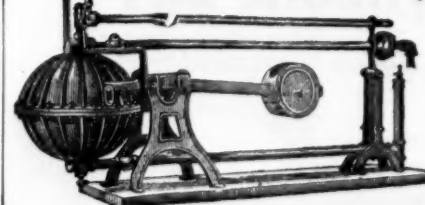
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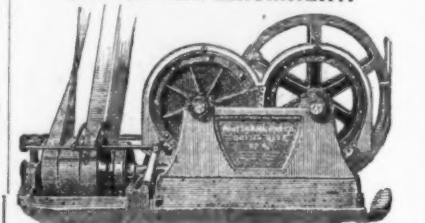
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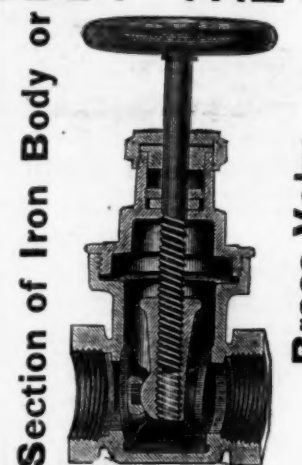


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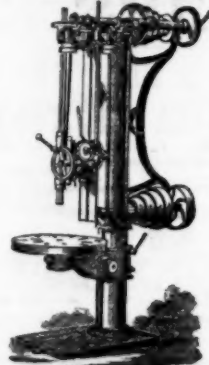
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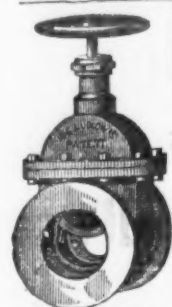
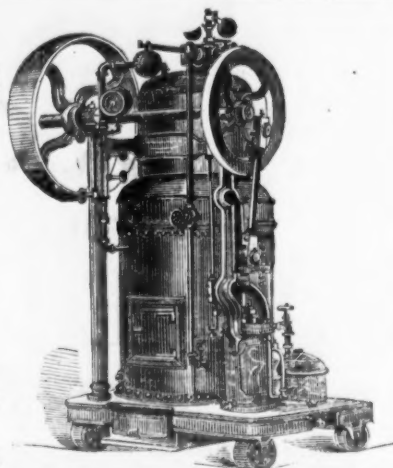
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THE  
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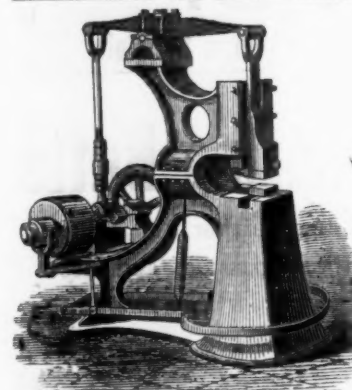
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\$200.00.Cheaper than any Engine offered of  
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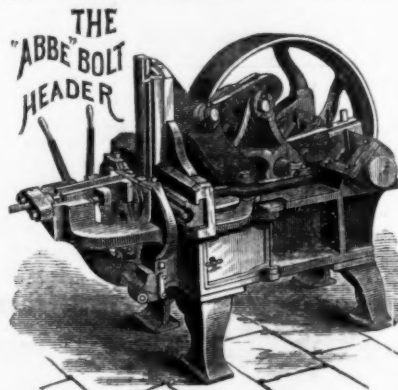
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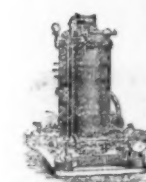
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wind direct from  
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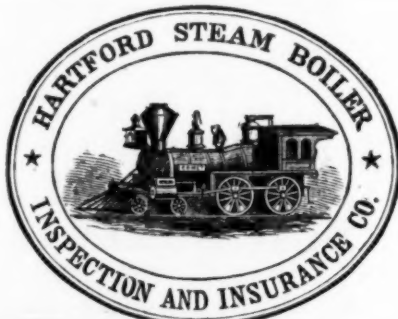
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Pulleys, from 4 inch to 10 feet in diameter.  
Pulleys made in two parts,  
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Plans taken, and Factories fitted out com-  
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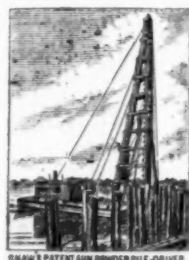
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DRAWN PATENT GUN POWDER PILE-DRIVER.



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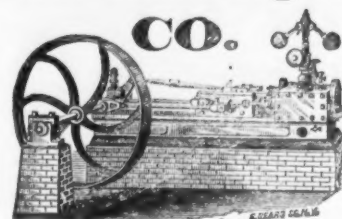
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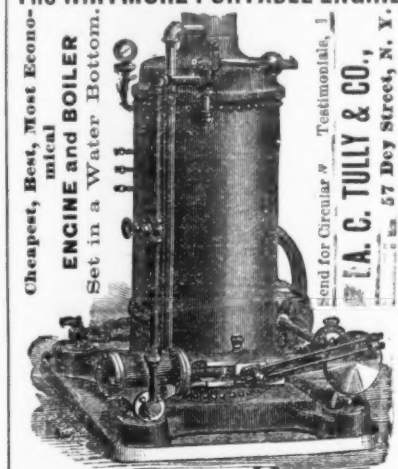
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**STEAM ENGINES.**The best and Most Complete Assortment in  
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These Engines have always maintained the very highest  
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Engines, Boilers and Saw Mills a specialty. We have  
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We are now building the celebrated Lane Circular Saw  
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We make the manufacture of saw mill outfits a  
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Our aim in all cases is to furnish the best machinery  
in the market, and work absolutely unequalled for dis-  
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Send for Circular and Price List.

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UTICA, N. Y.**The WHITMORE PORTABLE ENGINE****LATHES, PLANERS,**

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Superior to any other Light for Mining

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**JOHNSON'S PATENT UNIVERSAL  
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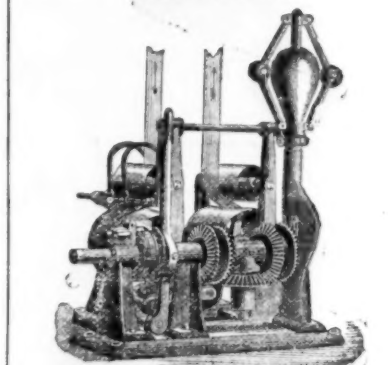
We invite attention  
to the superior con-  
struction of this chuck.  
Its working parts are  
absolutely pro-  
tected from dirt  
and chips. It is  
strong, compact and  
durable, and will be  
the greatest variety  
of work, as the jaws  
are adjustable with a  
range the full diam-

ter of the chuck. For Price List address,  
**Lambertville Iron Works, Lambertville, N.****DIFFERENTIAL GOVERNOR.****The HARTFORD GOVERNOR CO.,**

Sole makers of the

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FOR WATER.

Powerful, positive, radically new. Introduced and  
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760 South Broad Street, PHILADELPHIA.

### PAUL S. REEVES,

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## ANTI-FRICTION METALS.

XXX Genuine.....	40c	C.....	20c
XX.....	35c	D.....	15c
X.....	30c	E.....	10c
A.....	25c	F.....	5c

"Note."—The above are my standard mixtures, and have given satisfaction wherever used, but I am prepared to make Anti-Friction Metal of any quality or mixture desired by the purchaser.

**BRASS CASTINGS,** 21 to 30c. **INGOT BRASS,** 19 to 22c. **BRASS TURNINGS AND OLD METALS WANTED.**

ESTABLISHED 1842.

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P. O. Address: Frankford, Philad'a. MANUFACTURERS OF ALL KINDS OF

## Elliptic, Platform AND C Springs,

MADE EXCLUSIVELY FROM

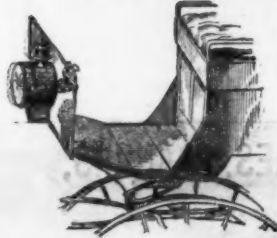
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CAST SPRING AND PLOW STEEL.  
CAST SHOVEL, HOE AND MACHINERY STEEL.OXFORD TOE, SLEIGH, TIRE AND SPRING STEEL.  
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BESSEMER MACHINERY AND CULTIVATOR STEEL.RE-ROLLED NORWAY SHAPES.  
NORWAY NAIL RODS ROLLED AND SLIT FROM SUPERIOR BRANDS.

## BOUDREN'S Patent Adjustable Dash-Lamp

FOR NIGHT DRIVING.



throws a powerful Light 100 feet ahead of the horse. Burns Kerosene without a chimney for 10 hours after one filling.  
Fits any shaped Dash or on any vehicle. Splendid Barn Lantern;  
Also good for Deer Hunting.  
The light is not affected by wind, rain or jolting. No person should be without one.

Price \$6, C. O. D., with privilege of examining. Address,  
**WHITE MFG. CO., Bridgeport, Conn.**  
A liberal discount to dealers. Send for Circular.  
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PATENTED JULY 25, 1871.

RE-ISSUED MAY 13, 1873, and JUNE 9, 1874.

In this Strap the liability of the leather to stretch and become loose and porous is prevented by the use of a patented non-extensible base, which supports the leather and secures

PERMANENT ELASTICITY.

We make this style with single rod, double rod, and wood frames, and intend that it shall, in quality compare favorably with our other well known brands.

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Orders promptly filled at lowest market rates.

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MANUFACTURED FOR

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Warranted to weld and to harden, and to be equal, if not superior, to any made.

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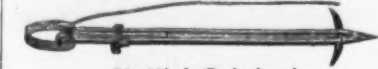
### Pointed, Polished & Finished Horse Shoe Nails.

Recommended by over 20,000 Horse Shoers.

All nails made from best NORWAY IRON, and warranted perfect and ready for driving. Orders filled promptly and at lowest rates by

**GLOBE NAIL CO., Boston, Mass.**

**NEW TIME TABLE.**  
Great Reduction in Time and Labor to the Farmer by using



**Nellis' Original HARPOON HORSE FORK,**  
Grapple and Pulleys; also, Nellis' Patent Stacker and Method of conveying Hay, straw, &c. A ton of Hay can be delivered in three to five minutes to any part of Mow or Stack. The right of Stacker and Conveyor granted FREE to the Farmer purchasing our Horse Hay Fork and Fixtures during season of 1875.

Nellis' Grapple. With it Pulleys can be attached or detached to rafter or beam, without the use of a ladder.

**NELLIS' PULLEY,**  
Improved Wrought Frame, Prepared Wood Wheel. Warranted superior to any Horse Fork Pulley offered in the market.

A trial of these goods will convince any farmer that he cannot afford to dispense with them, as their entire cost is often times saved by a single day's use. Also manufacturers of all descriptions

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ESTABLISHED 1840.

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No. 54 & 56 Fulton, and  
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Each mouse caught resets the Trap for another.

## TUBULAR

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BRASS AND IRON

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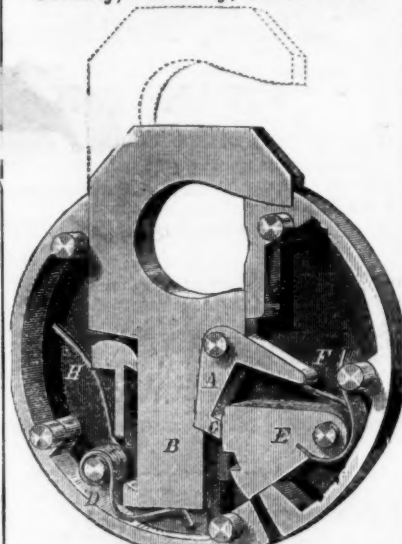
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A Substitute for Steel and Wrought Forgings.  
Circulars sent on application.

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Security, Durability, Convenience.



IMPROVED SELF-LOCKING

## Brass Pad Locks.

Made in the most substantial and compact manner, and are in every respect a superior article. We guarantee that no two locks are alike, unless specially ordered. Each lock furnished with two keys. Any number of locks or keys made to order. Adopted by the United States Government. Samples of No. 1 Lock sent to all parts free, on receipt of 47 1/2. Liberal Discounts to the Trade.

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Established 1827.

## DIXON'S Carburetor of Iron STOVE POLISH.

47 Years in Market.

For stove dealers we put up the genuine **DIXON'S STOVE POLISH** in 25 and 50 lb. boxes for sale by the pound.

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Manufacturers of

### Carriage, Tire, Plow, Stove AND OTHER

## BOLTS.

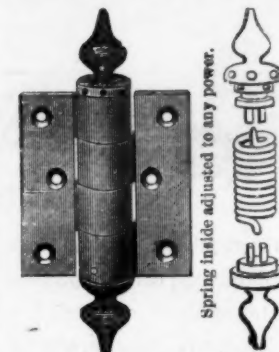
Carriage Bolts made from Best Square Iron, a Specialty.

THE

## American Spiral Spring Butts

Swing doors either way, allowing continual passing, and close them promptly, without noise.

Invaluable in cold weather, as summer can be used as ordinary hinges.



SINGLE ACTION BUTT, SWINGS DOOR ONE WAY.

## Very Desirable

FOR

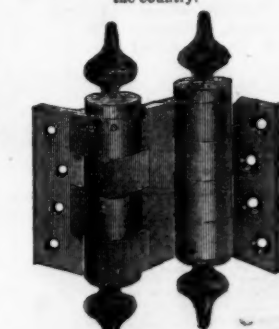
Stores, Banks &amp; Churches,

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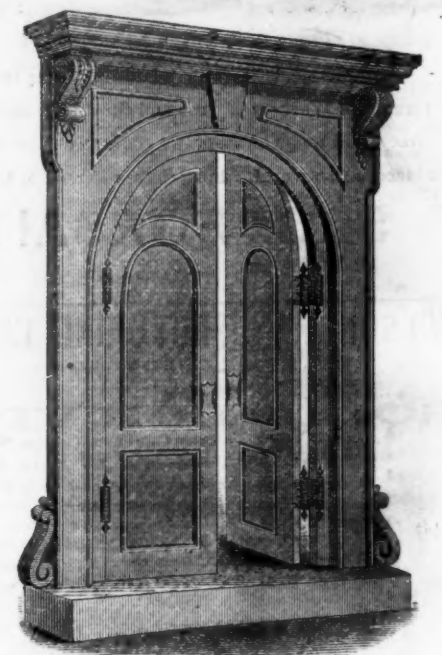
Outside Winter Doors.

Used on the

National Capitol,  
Patent Office,  
Treasury,  
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and important buildings throughout the country.



DOUBLE ACTION BUTT, SWINGS DOOR BOTH WAYS.



ROBERTS & CO.  
Noiseless Double Action Butt, as seen upon a door, swinging it both ways.

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Single Action.		Double Action.	
4 in. 3/8 in. 1/2 in. 5/8 in. 3/4 in. 7/8 in. 1 in.	4 in. 3/8 in. 1/2 in. 5/8 in. 3/4 in. 7/8 in. 1 in.	4 in. 3/8 in. 1/2 in. 5/8 in. 3/4 in. 7/8 in. 1 in.	4 in. 3/8 in. 1/2 in. 5/8 in. 3/4 in. 7/8 in. 1 in.
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Manufacture the most reliable

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They are plated by weight, and not by time or guess, containing 20 per cent. more silver than the usual standard, on a base of Nickel Silver, and finished by hand. Each article is guaranteed by the trade mark and warranted to give full satisfaction. We ask of the trade a fair and impartial trial, assuring them that the high standard already attained, shall be maintained. Send for Catalogue and Price.



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For Water, Gas and Steam.  
Importers and Dealers in PLUMBERS' MATERIALS,  
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